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STATIC RADAR CROSS SECTION OF LIGHT  
AIRCRAFT. VOLUME I. CESSNA 150L AT  
L-, S-, AND C-BANDS

Test Group (6585th)

Prepared for:

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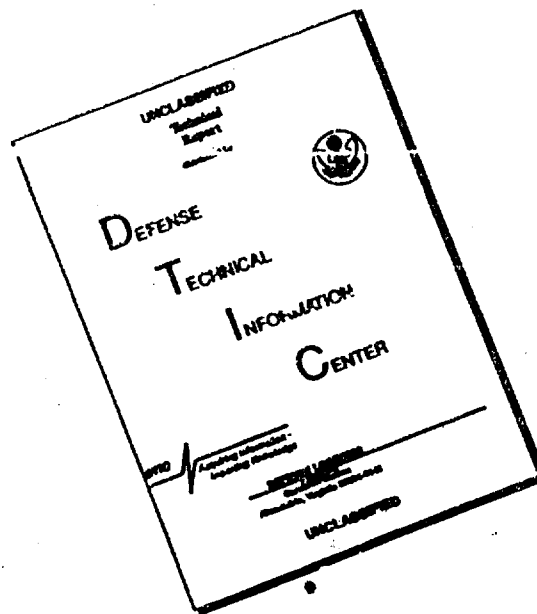
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16. Abstract  Static radar cross section (RCS) of a single-engine Cessna 150L utility aircraft was measured at 2700, 2800, and 2900 MHz over a range of aircraft attitudes of $\pm 10^\circ$ pitch, $0^\circ$ to $45^\circ$ roll, and also at 1250, 1350, 5000, and 5400 MHz at $0^\circ$ roll, $0^\circ$ pitch. Median RCS was independent of frequency in linear polarization but not in circular polarization. At S-Band the median RCS was nearly independent of roll and pitch except in the two broadside directions. In those two directions at roll angles between $20^\circ$ and $45^\circ$ median RCS was 6 dB to 10 dB greater when viewing the aircraft upper surface than when the radar aspect was into the lower surfaces of wing and fuselage at the same roll angle.			
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## SECTION I

### 1. Introduction

This document is Volume I of a three-volume set (References 1 and 2) on measurement of static radar cross section (RCS) of light aircraft. The measurement program comprised three types of single-engined aircraft:

- a. All-metal high wing
- b. All-metal low wing
- c. Fabric-covered (high wing)

Type (a), represented by a Cessna 150, is the subject of this report. Measurements on a Cherokee 140, typical of type (b), are presented in Volume II, and the data on type (c), a Super Cub, are given in Volume III.

The objective of the program was to measure static RCS of typical light aircraft over a range of frequencies, polarizations, and aspect angles. These data would aid in defining the need for and amount of RCS enhancement on light aircraft to improve their visibility on FAA airport surveillance radars.

The data measurements were made at the Radar Target Scatter Division (RAT SCAT) of the 6585th Test Group located on the Alkali Flats, Holloman Air Force Base, New Mexico.

### 2. Description of Target

The RCS data presented in this report were measured on a Model 150L utility aircraft, serial number 15074034, manufactured in 1972 by the Cessna Aircraft Company, Wichita, Kansas. An Airworthiness Certificate was issued 10 November 1972, a Certificate of Aircraft Registration was issued 19 January 1973.

The aircraft (Figure 1) was equipped with a VOR navigation antenna on the vertical stabilizer, a VHF communication antenna on the cabin roof, and an emergency locator transmitter antenna on the top of the fuselage just forward of the dorsal fin.

The aircraft was flown to the test site. The only things done to prepare it for RCS measurement were (1) drain the fuel and engine oil, (2) lock the control system in neutral, and (3) set the propeller to horizontal (approximately). The radio equipment was turned off during all testing.

### 3. Instrumentation

Data measurement was achieved with a long-pulse radar system operating on a ground plane range. Figure 2 illustrates the components of the measurement range. The radar transmitter, receiver, control console, and data recorders were housed in a mobile van. The antennas were supported on a mobile tower. Rotation of the target in azimuth was controlled from the van and azimuth synchro signals were returned to the van through an underground electrical conduit.

The radar transmitter uses an oscillator to drive a low-level, pulsed TWT that in turn drives a high-level pulsed TWT to provide 1 KW peak output power. The receiver is a range-gated superheterodyne system. The range gate controls the ON time of the 60 MHz IF amplifier. The time interval that the IF amplifier is ON can be set by the radar operator to correspond to any desired position along the measurement range. A 60 MHz reference signal from the control console is injected into the receiver through a variable attenuator. The amplitude difference between the target signal and the reference signal is applied to a servo that drives the variable attenuator to make both signals equal. A potentiometer and a digital encoder geared to the servo system follow the varying position of the attenuator and provide signals for an analog recorder (polar or rectilinear) and a digital recorder (punch paper tape or magnetic tape).

Sections 1 and 2 of Appendix A and Table A-1 of Appendix A summarize the characteristics of RAT SCAT facilities and equipment. The information applies to mobile-mounted equipment as well as to the fixed installations. A mobile test van was used in this program in order to operate over a range length not available on the fixed ranges.

The RCS measurements presented in this report were obtained on a ground plane range wherein the target is measured near to the ground. The ground is present as a scattering object and in such a circumstance coupling between orthogonal components of the transmitted and received fields may exist other than the coupling introduced by the target. This coupling (or depolarizing) can be a problem only for measurement in circular polarization. References 3 and 4 describe the theoretical and experimental studies made on the subject specifically for the RAT SCAT range. It was shown that circular polarization measurements can be made on a ground plane range. The size of the useful target region is approximately the same when circular polarization is used as that obtained when linear polarization is used with the amplitude curvature in the vertical plane being the limiting factor in both cases. Standardized calibration procedures used at RAT SCAT assure the accuracy of RCS measurements using circular polarization.

The primary calibration standard for linear polarization was a 26.6 inch diameter precision aluminum sphere and was used at all measurement frequencies. The primary calibration standard for circular polarization was a ninety-degree dihedral corner with square faces 0.85 meters in each dimension. This corner was calibrated against the precision sphere, making use of a 45° dipole to transfer from linear to circular polarization. The secondary reference standard (approximately mid-range on Figure 2) was a trihedral corner. This secondary standard was used for both linear and circular polarization.

The radar antennas were parabolic dishes with dipole feeds for linear polarization and planar spiral feeds for circular polarization. Circularity was below 0.7 dB at all frequencies.

#### 4. Procedure

Data on this program were obtained at seven frequencies and three polarizations over a range of roll and pitch angles as summarized in Table I.

Table I - RCS Measurement Matrix

Freq. (MHz)	Polarization	Roll Angle (Degrees)	Pitch Angle (Degrees)
1250	VV,HH,RR	0	0
1350	VV,HH,RR	0	0
2700	VV,--,RR	0,5,10,20,30,45	-10,-5,0,+5,+10
2800	VV,HH,RR	0,5,10,20,30,45	-10,-5,0,+5,+10
2900	VV,--,RR	0,5,10,20,30,45	-10,-5,0,+5,+10
5000	VV,HH,--	0	0
5400	VV,HH,--	0	0

The first letter designating polarization defines the polarization of the transmit antenna, the second letter defines polarization of the receive antenna. The nomenclature follows common practice in which only the spatial orientation of the electric field vector is specified: V for vertical, H for horizontal, R for right-hand circular.

The aircraft was placed on the support columns at the azimuth turntable by a mobile crane. Figure 4 shows the equipment needed to place the target in position for test. The aircraft was supported by nylon web straps from a load beam attached to the crane. The nylon straps were positioned around the nose and tail of the aircraft in such a way that the aircraft would be in approximately the desired roll attitude when lifted. The aircraft was swung over the turntable and lowered onto the transition sections on top of each column. The two columns were expanded polystyrene fabricated in vertical wedge sections to form a cone with circular cross section. The transitions, of similar material, were pre-shaped to fit the aircraft fuselage and support the target on the columns at the desired roll and pitch attitude.

The aircraft was braced on the columns by a network of parachute cord tied to the fuselage, tail, and wing struts, and anchored to winches on the azimuth turntable. The target was set to the desired roll and pitch by adjusting tension on the tie-down cords. Roll and pitch angle were measured at the propeller hub. The propeller was rotated to an index line, the spinner was removed and a protractor placed on the propeller hub. Roll angle was measured by sighting a transit on the retractor. Pitch angle was measured on the front of the propeller hub with an inclinometer. Pitch angle thus was measured with respect to the axis of the engine crankshaft. Both roll and pitch were set to an accuracy of  $\pm 0.5$  degrees.

In Figure 4 the aircraft has been set to 20 degrees roll, 10 degrees positive pitch and the load beam is being detached. In Figure 5 the ground equipment has been removed and the target is ready for measurement. The polystyrene collar on the aft fuselage is the bearing structure for the aft lifting strap from the load beam. Target RCS measured at S-Band with and without the collar in place gave identical results so the collar was left in place at all times to facilitate attaching the aircraft to the crane in case surface wind velocity suddenly increased or became gusty.

Target height was 14 feet at L- and C-Bands, 16 feet at S-Band. Target height is the vertical distance between ground level and a horizontal line (the pitch axis) through the half height of the fuselage midway between aircraft nose and tail, measured with the aircraft in level flight attitude. Figure 3 illustrates the relation between target height and the axes of pitch and yaw.

A target being measured on a ground plane range is in an electromagnetic field that is the vector sum of (1) the wave energy that travels directly from antenna to target, (2) the wave energy reflected from the surface of the earth, and (3) the wave energy that travels along the surface of the earth. The vector sum produces an interference pattern.

Antenna height is adjusted so that the target is located in the first lobe of the interference pattern described by the equation

$$H_a = \frac{\lambda R}{4 H_t}$$

where  $H_a$  is antenna height,  $H_t$  is target height,  $\lambda$  is wavelength, and  $R$  is range length. In order to obtain accurate RCS measurements the following steps are required:

- (a) Adjust antenna height and pointing direction for best field uniformity across the volume occupied by the target.
- (b) Tilt the azimuth turntable so the target rotates in the plane of the antenna beam.
- (c) Minimize reflections from target supports, tie-downs and turntable.
- (d) Calibrate the range at all frequencies and polarizations.

The range parameters used on the program after the above steps were carried out at each frequency are summarized in Table II.

Measurement of RCS began with the three frequencies in S-Band: 2700 MHz, 2800 MHz and 2900 MHz. Because of the large effort required to mount the target for measurement it was prudent to record as many RCS patterns as possible for each mounting of the target. For that reason four antennas were used: one pair for linear polarization, the other pair for circular polarization. The antenna pairs were switched to the radar transmitter and receiver as required. That arrangement allowed measurement of seven RCS patterns for each roll/pitch attitude of the target. If weather conditions remained favorable upon completion of such a pattern group the target was set to the next roll/pitch attitude and RCS measurement went on, continuing until dark. A post-test calibration was then made. If weather became unfavorable (wind velocity above 10 knots, or rain) the target was removed from the turntable and the post-test calibration was made as quickly as possible. In any event the aircraft was not measured in wind velocity above 10 knots or after dark, and the range was calibrated before and after a sequence of measurements. The post-test calibration for one day was not used as the pre-test calibration for the next sequence of measurements. Each day began with a new calibration.

At L-Band (1250 MHz and 1350 MHz) one pair of antennas was used instead of two pair because only one target roll/pitch attitude was

measured (see Table I). The two linear patterns were measured at each frequency followed by the post-test calibration. The linear feeds were replaced by the circular feeds, and a new calibration was made at the two frequencies. The two circular polarization patterns were then measured, ending with a post-test calibration.

At C-Band (5000 MHz and 5400 MHz) only linear patterns were required, all of which were recorded without re-calibration for circular polarization.

## 5. Results

The RCS patterns presented in this report are copies of the original recorded data. Each pattern includes a calibration reference level from which the decibel scale was labelled. Each pattern also is marked with azimuth angle (horizontal scale at the bottom), and is identified as to pitch and roll angle, all of which are defined in Appendix B.

The patterns represent considerable amount of data, containing as they do the dependence of RCS on all combinations of frequency, polarization, roll angle, and pitch angle. Representative relationships, making use of median RCS to simplify the data, are shown in Figures 6 through 9. Median RCS was computed for a 10 degree azimuth increment with a 5 degree overlap.

The median RCS for linear polarization with the aircraft at 0° roll and 0° pitch was independent of frequency. Other roll and pitch attitudes were not measured at all frequencies so that data are not available to support a more general conclusion. The affect of circular polarization could not be examined over the entire frequency range because circular polarization was not used at C-Band. However, the median RCS at 2800 MHz was about 7 dB greater than at 1250 MHz indicating that RCS in circular polarization is frequency dependent.

Figure 7 illustrates the affect of roll angle (at zero degrees pitch) with vertical polarization at 2800 MHz. The graph shows contours of median RCS in decibels. Horizontal lines are patterns of RCS vs azimuth at fixed roll angles. Vertical lines indicate the affect of roll angle at a given azimuth direction. Variation of RCS with roll angle is greatest in the 90° direction (or the 270° direction for negative roll angles) where the radar line of sight is onto the upper surface of the wing. At other azimuth angles the RCS variation with roll is trivial.

A similar result was found with RR polarization at 2800 MHz, as illustrated in Figure 8. The affect of roll angle on RCS was greatest in the 90 degree direction (or 270 degree direction for negative roll).

Horizontal polarization was very similar to vertical polarization and has not been shown in this set of figures.

Figures 8 and 9 show how pitch angle influenced RCS at 2800 MHz with the aircraft at zero degrees roll. Variation of RCS at vertical (and horizontal) polarization, Figure 8, was small over the measured range of pitch angles. With RR circular polarization, Figure 9, the variation was not large in terms of decibel range but the variation did cover a greater span of azimuth angles, not being restricted to the 90° or 270° azimuth directions.

#### 6. References

1. AFSWC-TR-73-46, Volume II, Static RCS of Light Aircraft, Cherokee 140 at L-, S-, C-Bands, Dec 1973.
2. AFSWC-TR-73-46, Volume III, Static RCS of Light Aircraft, Super Cub at L-, S-, C-Bands, Dec 1973.
3. RADC-TDR-63-424, An Analysis of the Polarization Capabilities of a Ground Plane Cross Section Range, October 1963.
4. RADC-TDR-64-360, Experimental Results of Circular Polarization and Scattering Matrix Measurements, June 1964.



Table II Test Range Parameters for Cassia 150L RCS Measurements

Freq. (MHz)	Target Ht. (ft)	Antenna Ht. (ft)	Antenna Diameter (ft)	Range (ft)	Table Tilt (Min)
1250	14	12'-6"	10	1150	42
1350	14	12'-6"	10	1150	42
2700	16	12'-6"	6	2100	26
2800	16	12'-6"	6	2100	26
2900	16	12'-6"	6	2100	26
5000	14	6'-5"	4	2100	23
5400	14	5'-10"	4	2100	23

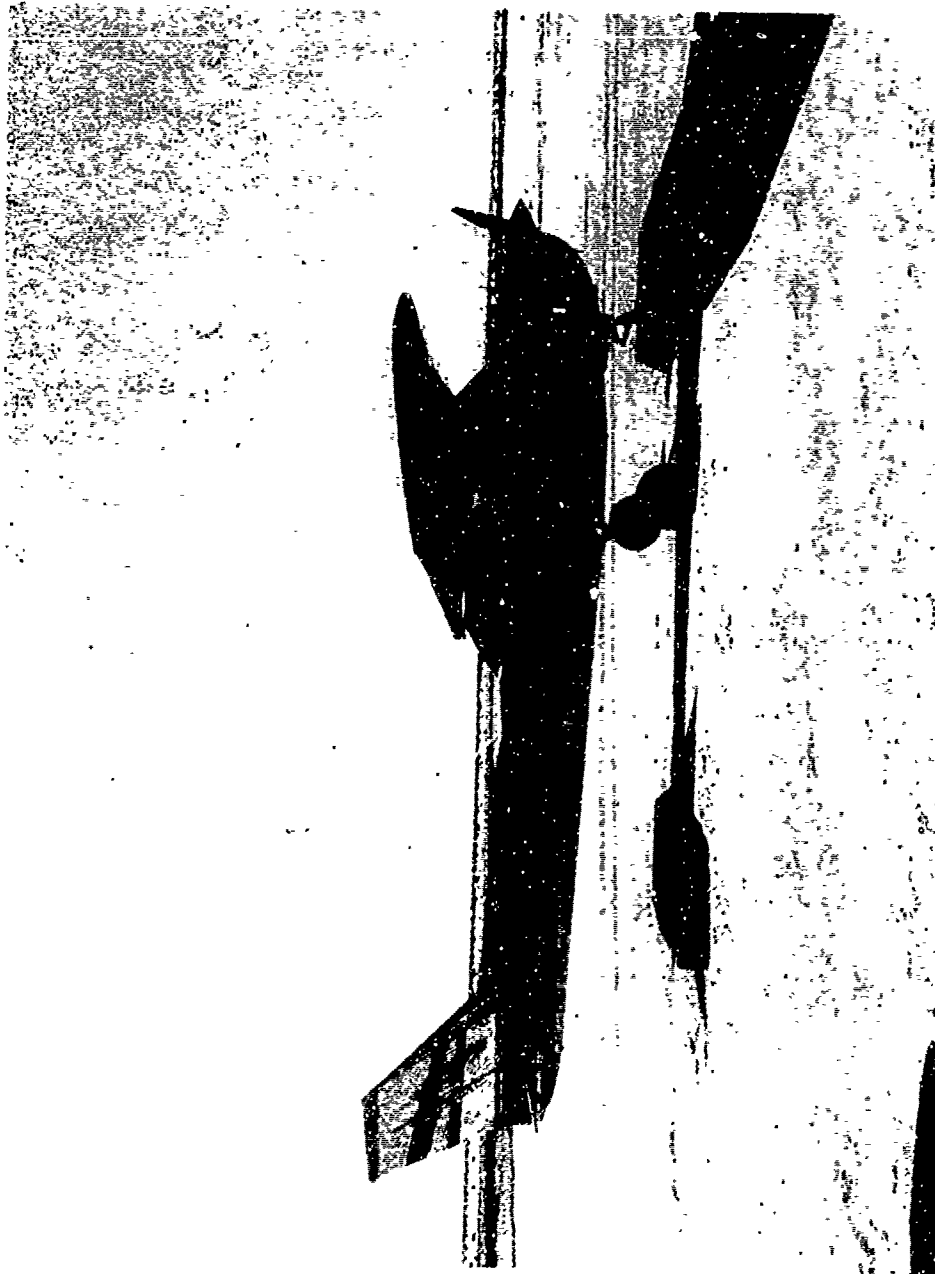


Figure 1. Cessna 150L Utility Aircraft

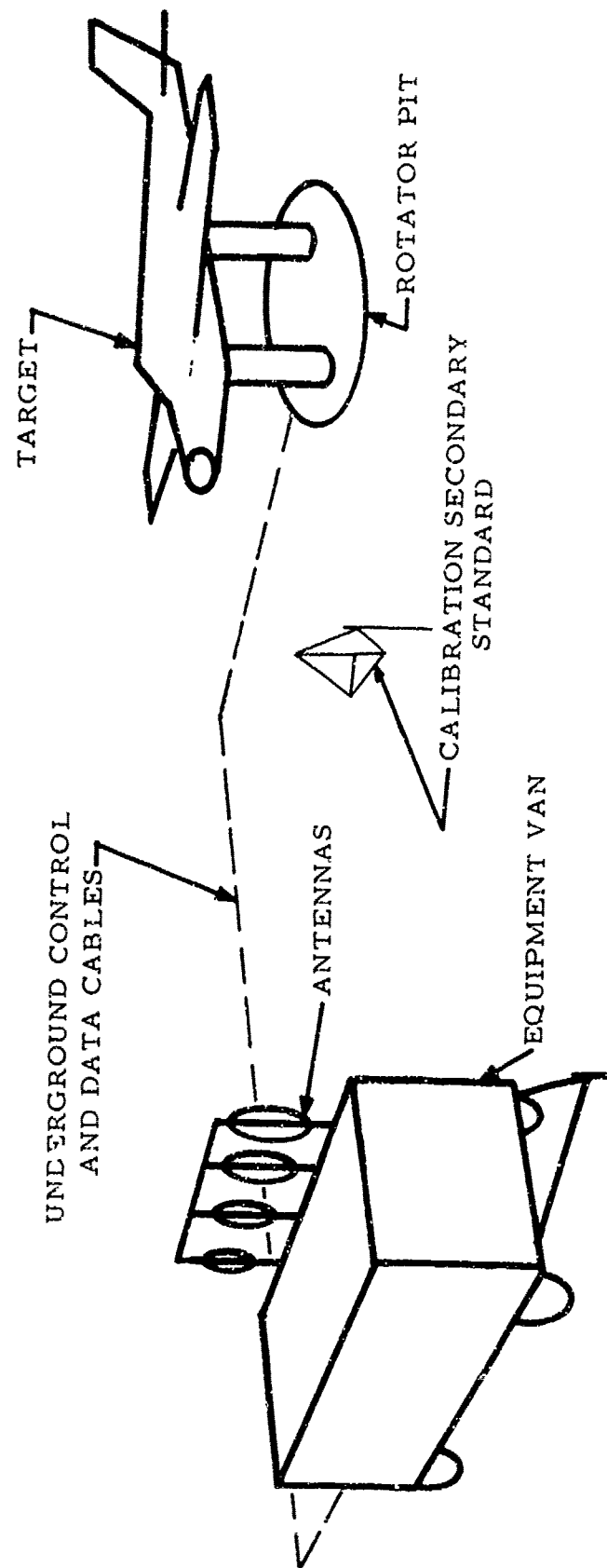


Figure 2. Elements of the radar measurement range.

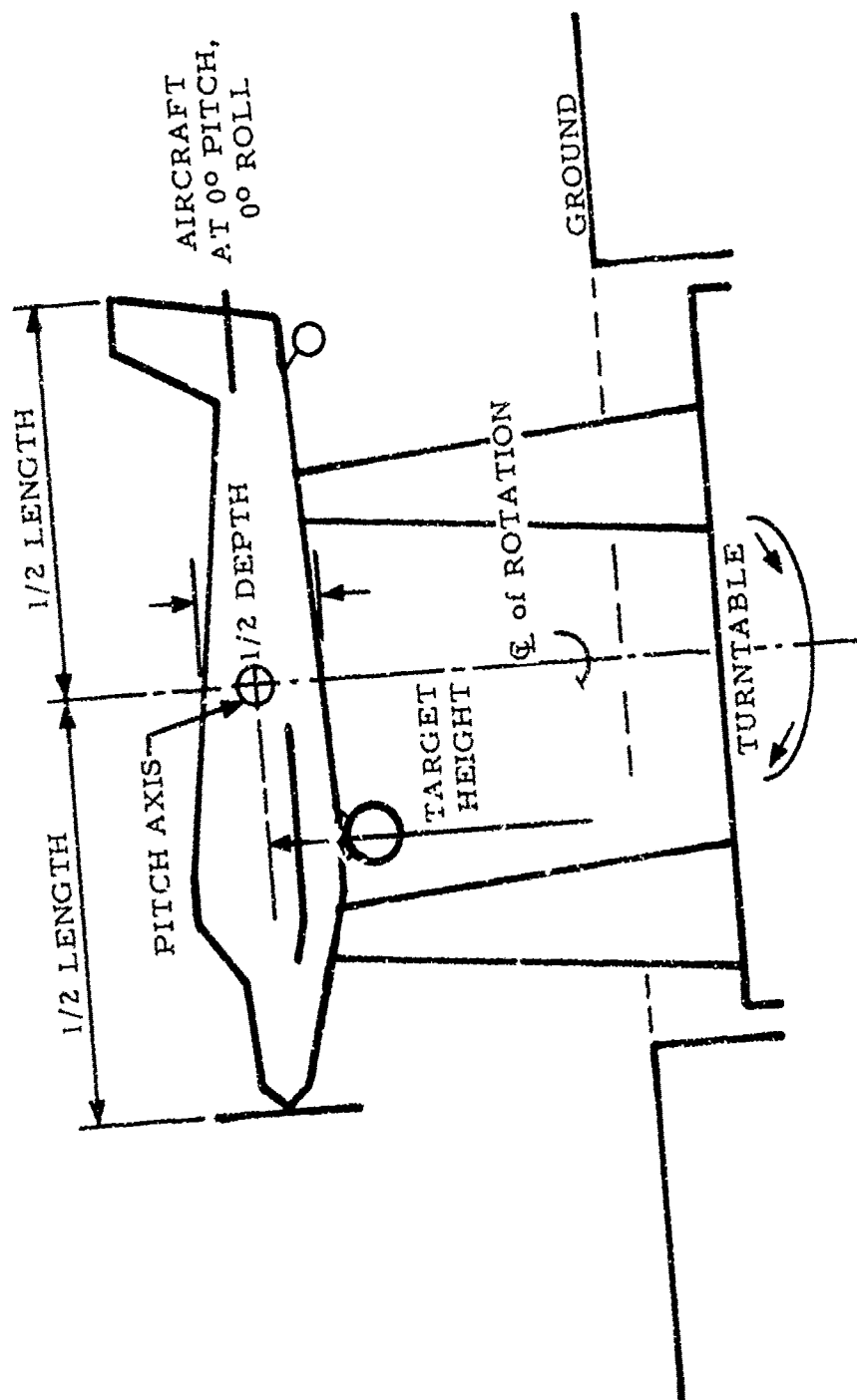


Figure 3. Aircraft mounting geometry showing location of pitch axis, yaw axis and designation of target height.

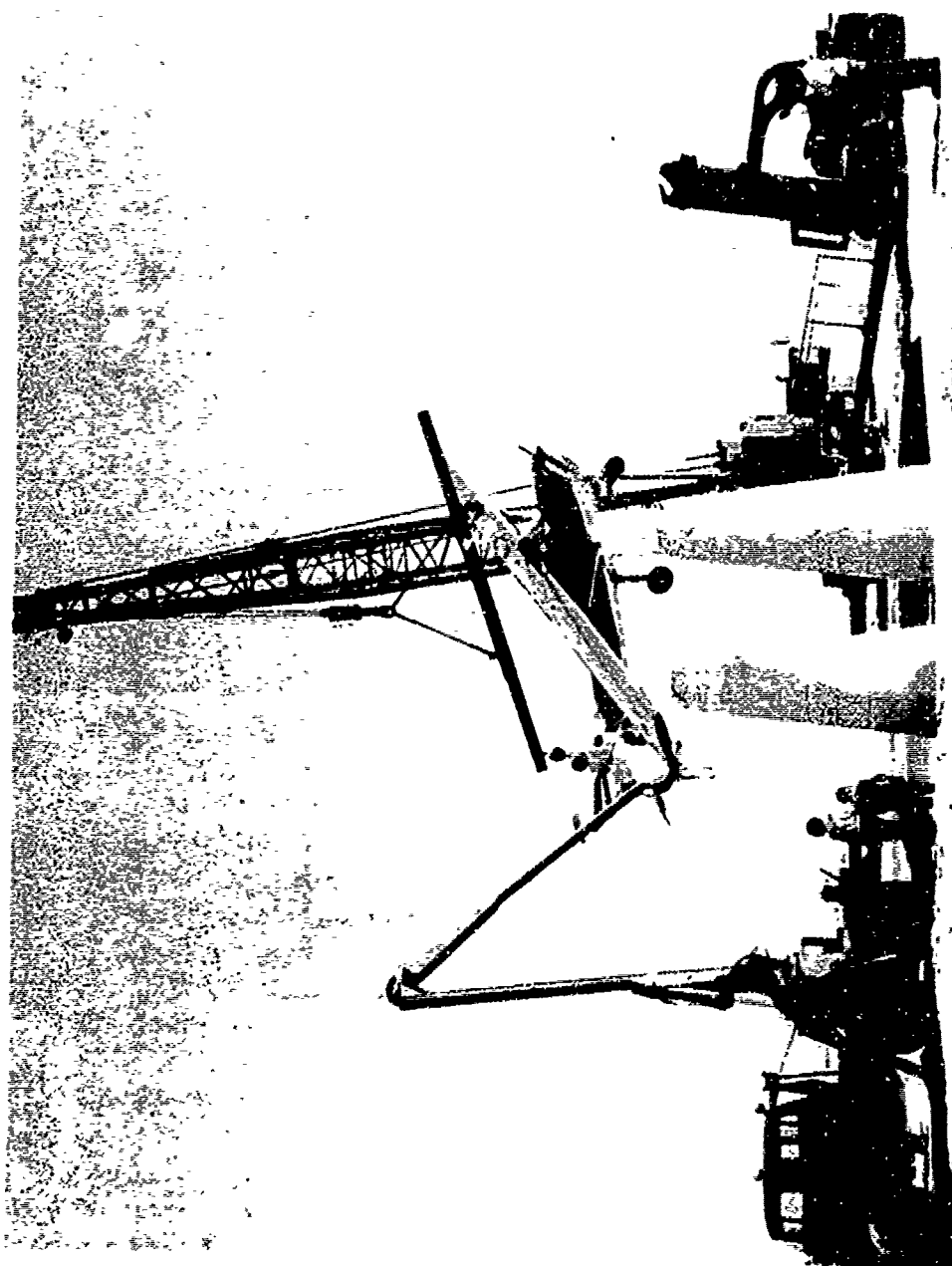


Figure 4. Aligning Cessna 150L for Test



Figure 5. Cessna 150L Mounted for RCS Measurement  
at  $20^\circ$  Roll,  $+10^\circ$  Pitch

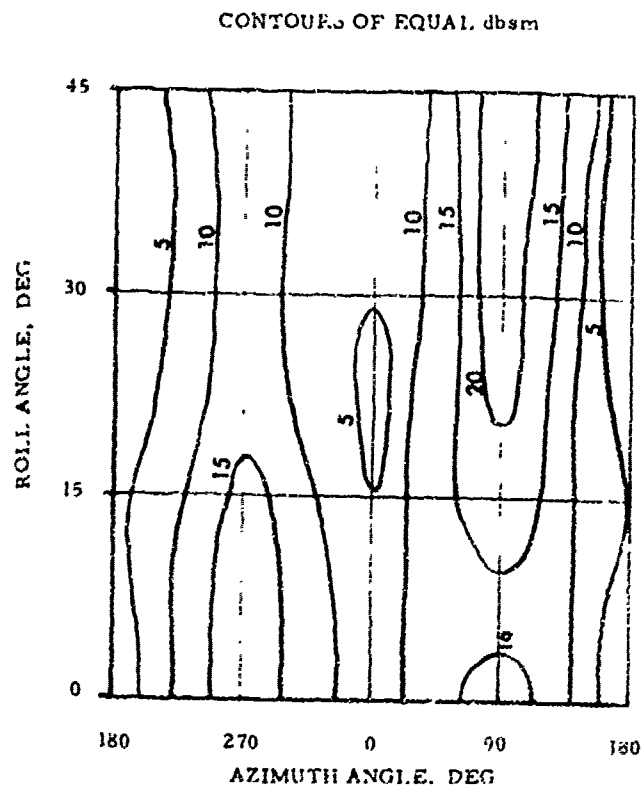


Figure 6. RCS vs Roll Angle at 0° pitch angle for 2800 MHz, VV polarization

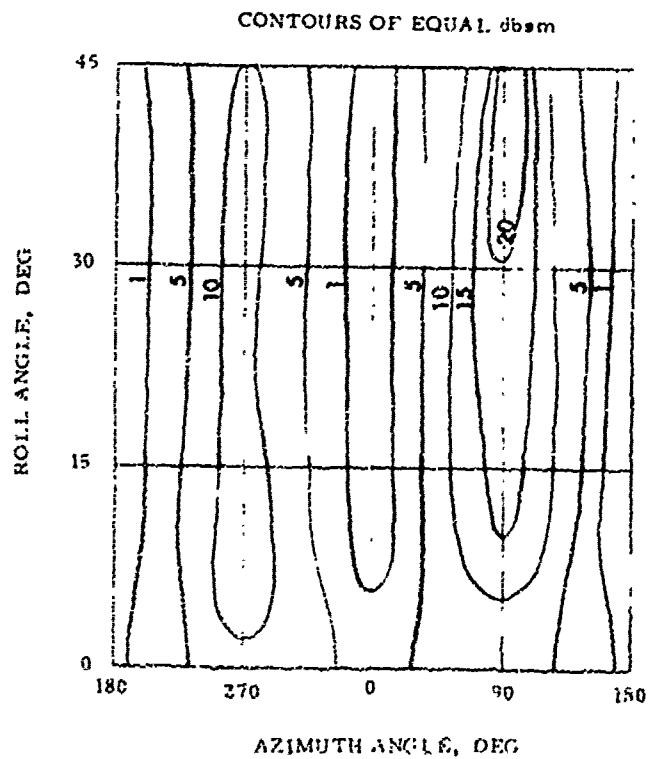


Figure 7. RCS vs Roll Angle at 0° pitch angle for 2800 MHz, RR polarization

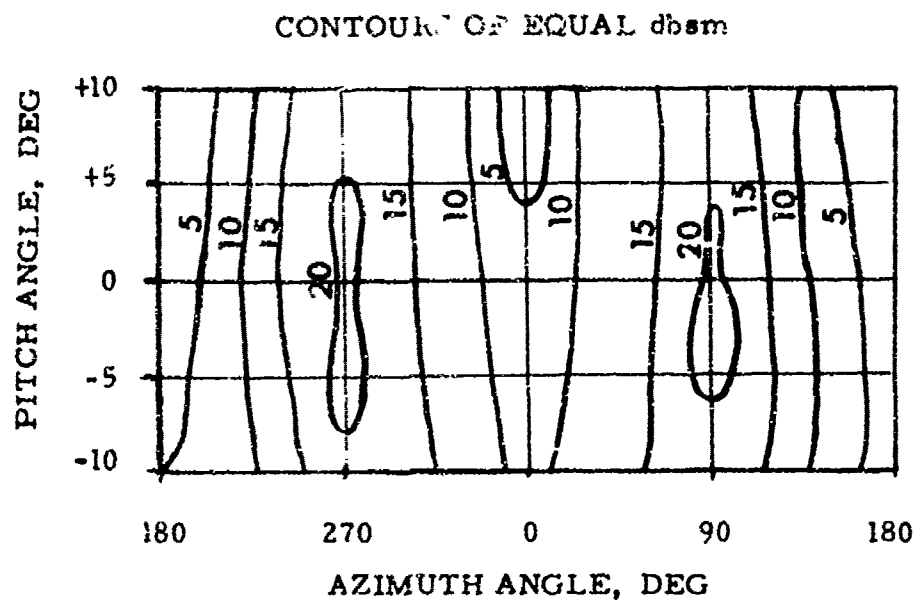


Figure 8. RCS vs Pitch Angle at  $0^\circ$  roll angle for 2800 MHz, VV polarization.

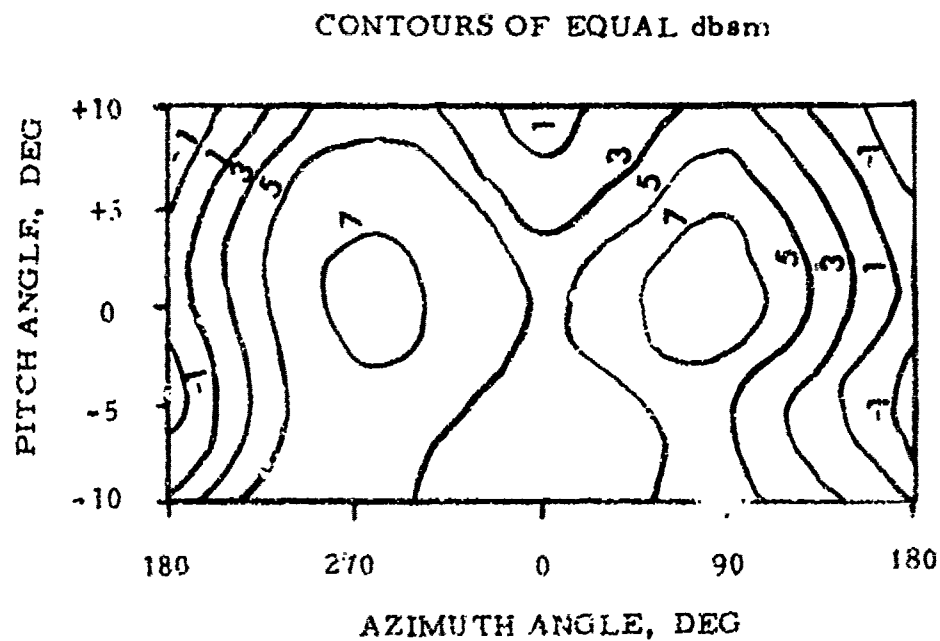


Figure 9. RCS vs Pitch Angle at  $0^\circ$  roll angle for 2800 MHz, RR polarization.



CONTROL NUMBER 73-01			Table III		DATA PLOT INDEX		Sheet 1	
PAGE NO.	RUN	FREQ (MHz)	POLARIZATION	PITCH ANGLE	ROLL ANGLE	TARGET CONFIGURATION AND REMARKS		
24	49	2700	VV	-5	0	Cessna 150 Airplane		
25	25	2700	VV	-5	0	Cessna 150 Airplane		
26	23	2700	VV	0	0	Cessna 150 Airplane		
27	28	2700	VV	+5	0	Cessna 150 Airplane		
28	30	2700	VV	+10	0	Cessna 150 Airplane		
29	115	2700	VV	-10	5	Cessna 150 Airplane		
30	114	2700	VV	-5	5	Cessna 150 Airplane		
31	128	2700	VV	0	5	Cessna 150 Airplane		
32	94	2700	VV	+5	5	Cessna 150 Airplane		
33	93	2700	VV	+10	5	Cessna 150 Airplane		
34	157	2700	VV	-10	10	Cessna 150 Airplane		
35	149	2700	VV	-5	10	Cessna 150 Airplane		
36	136	2700	VV	0	10	Cessna 150 Airplane		
37	184	2700	VV	+5	10	Cessna 150 Airplane		
38	185	2700	VV	+10	10	Cessna 150 Airplane		
39	318	2700	VV	-10	20	Cessna 150 Airplane		
40	297	2700	VV	-5	20	Cessna 150 Airplane		
41	227	2700	VV	0	20	Cessna 150 Airplane		
42	276	2700	VV	+5	20	Cessna 150 Airplane		
43	288	2700	VV	+10	20	Cessna 150 Airplane		
44	397	2700	VV	-10	30	Cessna 150 Airplane		
45	384	2700	VV	-5	30	Cessna 150 Airplane		
46	325	2700	VV	0	30	Cessna 150 Airplane		
47	345	2700	VV	+5	30	Cessna 150 Airplane		
48	382	2700	VV	+10	30	Cessna 150 Airplane		
49	493	2700	VV	-10	45	Cessna 150 Airplane		
50	470	2700	VV	-5	45	Cessna 150 Airplane		
51	418	2700	VV	0	45	Cessna 150 Airplane		
52	433	2700	VV	+5	45	Cessna 150 Airplane		
53	467	2700	VV	+10	45	Cessna 150 Airplane		
54	63	2700	VV	N/A	N/A	Background with 0° roll, -10° pitch transitions		
55	632	2700	VV	N/A	N/A	Background with 45° roll, -10° pitch transitions		

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DATA PLOT INDEX

TABLE SIX

TARGET CONFIGURATION AND REMARKS

NO.	TIME	ALTITUDE	TYPE	ANGLE	REMARKS
1	0000	10000	150 Airplane	0	
2	0005	10000	150 Airplane	0	
3	0010	10000	150 Airplane	0	
4	0015	10000	150 Airplane	0	
5	0020	10000	150 Airplane	0	
6	0025	10000	150 Airplane	0	
7	0030	10000	150 Airplane	0	
8	0035	10000	150 Airplane	0	
9	0040	10000	150 Airplane	0	
10	0045	10000	150 Airplane	0	
11	0050	10000	150 Airplane	0	
12	0055	10000	150 Airplane	0	
13	0100	10000	150 Airplane	0	
14	0105	10000	150 Airplane	0	
15	0110	10000	150 Airplane	0	
16	0115	10000	150 Airplane	0	
17	0120	10000	150 Airplane	0	
18	0125	10000	150 Airplane	0	
19	0130	10000	150 Airplane	0	
20	0135	10000	150 Airplane	0	
21	0140	10000	150 Airplane	0	
22	0145	10000	150 Airplane	0	
23	0150	10000	150 Airplane	0	
24	0155	10000	150 Airplane	0	
25	0200	10000	150 Airplane	0	
26	0205	10000	150 Airplane	0	
27	0210	10000	150 Airplane	0	
28	0215	10000	150 Airplane	0	
29	0220	10000	150 Airplane	0	
30	0225	10000	150 Airplane	0	
31	0230	10000	150 Airplane	0	
32	0235	10000	150 Airplane	0	
33	0240	10000	150 Airplane	0	
34	0245	10000	150 Airplane	0	
35	0250	10000	150 Airplane	0	
36	0255	10000	150 Airplane	0	
37	0300	10000	150 Airplane	0	
38	0305	10000	150 Airplane	0	
39	0310	10000	150 Airplane	0	
40	0315	10000	150 Airplane	0	
41	0320	10000	150 Airplane	0	
42	0325	10000	150 Airplane	0	
43	0330	10000	150 Airplane	0	
44	0335	10000	150 Airplane	0	
45	0340	10000	150 Airplane	0	
46	0345	10000	150 Airplane	0	
47	0350	10000	150 Airplane	0	
48	0355	10000	150 Airplane	0	
49	0400	10000	150 Airplane	0	
50	0405	10000	150 Airplane	0	
51	0410	10000	150 Airplane	0	
52	0415	10000	150 Airplane	0	
53	0420	10000	150 Airplane	0	
54	0425	10000	150 Airplane	0	
55	0430	10000	150 Airplane	0	
56	0435	10000	150 Airplane	0	
57	0440	10000	150 Airplane	0	
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59	0450	10000	150 Airplane	0	
60	0455	10000	150 Airplane	0	
61	0500	10000	150 Airplane	0	
62	0505	10000	150 Airplane	0	
63	0510	10000	150 Airplane	0	
64	0515	10000	150 Airplane	0	
65	0520	10000	150 Airplane	0	
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80	0635	10000	150 Airplane	0	
81	0640	10000	150 Airplane	0	
82	0645	10000	150 Airplane	0	
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86	0705	10000	150 Airplane	0	
87	0710	10000	150 Airplane	0	
88	0715	10000	150 Airplane	0	
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90	0725	10000	150 Airplane	0	
91	0730	10000	150 Airplane	0	
92	0735	10000	150 Airplane	0	
93	0740	10000	150 Airplane	0	
94	0745	10000	150 Airplane	0	
95	0750	10000	150 Airplane	0	
96	0755	10000	150 Airplane	0	
97	0800	10000	150 Airplane	0	
98	0805	10000	150 Airplane	0	
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106	0845	10000	150 Airplane	0	
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108	0855	10000	150 Airplane	0	
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110	0905	10000	150 Airplane	0	
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112	0915	10000	150 Airplane	0	
113	0920	10000	150 Airplane	0	
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117	0940	10000	150 Airplane	0	
118	0945	10000	150 Airplane	0	
119	0950	10000	150 Airplane	0	
120	0955	10000	150 Airplane	0	
121	1000	10000	150 Airplane	0	
122	1005	10000	150 Airplane	0	
123	1010	10000	150 Airplane	0	
124	1015	10000	150 Airplane	0	
125	1020	10000	150 Airplane	0	
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129	1040	10000	150 Airplane	0	
130	1045	10000	150 Airplane	0	
131	1050	10000	150 Airplane	0	
132	1055	10000	150 Airplane	0	
133	1100	10000	150 Airplane	0	
134	1105	10000	150 Airplane	0	
135	1110	10000	150 Airplane	0	
136	1115	10000	150 Airplane	0	
137	1120	10000	150 Airplane	0	
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139	1130	10000	150 Airplane	0	
140	1135	10000	150 Airplane	0	
141	1140	10000	150 Airplane	0	
142	1145	10000	150 Airplane	0	
143	1150	10000	150 Airplane	0	
144	1155	10000	150 Airplane	0	
145	1200	10000	150 Airplane	0	
146	1205	10000	150 Airplane	0	
147	1210	10000	150 Airplane	0	
148	1215	10000	150 Airplane	0	
149	1220	10000	150 Airplane	0	
150	1225	10000	150 Airplane	0	
151	1230	10000	150 Airplane	0	
152	1235	10000	150 Airplane	0	
153	1240	10000	150 Airplane	0	
154	1245	10000	150 Airplane	0	
155	1250	10000	150 Airplane	0	
156	1255	10000	150 Airplane	0	
157	1300	10000	150 Airplane	0	
158	1305	10000	150 Airplane	0	
159	1310	10000	150 Airplane	0	
160	1315	10000	150 Airplane	0	
161	1320	10000	150 Airplane	0	
162	1325	10000	150 Airplane	0	
163	1330	10000	150 Airplane	0	
164	1335	10000	150 Airplane	0	
165	1340	10000	150 Airplane	0	
166	1345	10000	150 Airplane	0	
167	1350	10000	150 Airplane	0	
168	1355	10000	150 Airplane	0	
169	1400	10000	150 Airplane	0	
170	1405	10000	150 Airplane	0	
171	1410	10000	150 Airplane	0	
172	1415	10000	150 Airplane	0	
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219	1810	10000	150 Airplane	0	
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224	1835	10000	150 Airplane	0	
225	1840	10000	150 Airplane	0	
226	1845	10000	150 Airplane	0	
227	1850	10000	150 Airplane	0	
228	1855	10000	150 Airplane	0	
229	1900	10000	150 Airplane	0	
230	1905	10000	150 Airplane	0	
231	1910	10000	150 Airplane	0	

CONTROL NUMBER 73-01

Table III

DATA PLOT INDEX

Sheet 3

PAGE NO.	RUN	FREQ (MHz)	POLARIZATION	PITCH ANGLE	ROLL ANGLE	TARGET CONFIGURATION AND REMARKS
88	46	2800	VV	-10	0	Cessna 150 Airplane
89	27	2800	VV	-5	0	Cessna 150 Airplane
90	20	2800	VV	0	0	Cessna 150 Airplane
91	74	2800	VV	+5	0	Cessna 150 Airplane
92	83	2800	VV	+0	0	Cessna 150 Airplane
93	118	2800	VV	-10	5	Cessna 150 Airplane
94	111	2800	VV	-5	5	Cessna 150 Airplane
95	124	2800	VV	0	5	Cessna 150 Airplane
96	97	2800	VV	+5	5	Cessna 150 Airplane
97	90	2800	VV	+10	5	Cessna 150 Airplane
98	159	2800	VV	-10	10	Cessna 150 Airplane
99	146	2800	VV	-5	10	Cessna 150 Airplane
100	139	2800	VV	0	10	Cessna 150 Airplane
101	181	2800	VV	+5	10	Cessna 150 Airplane
102	210	2800	VV	+10	10	Cessna 150 Airplane
103	307	2800	VV	-10	20	Cessna 150 Airplane
104	300	2800	VV	-5	20	Cessna 150 Airplane
105	259	2800	VV	0	20	Cessna 150 Airplane
106	219	2800	VV	+5	20	Cessna 150 Airplane
107	286	2800	VV	+10	20	Cessna 150 Airplane
108	344	2800	VV	-10	30	Cessna 150 Airplane
109	387	2800	VV	-5	30	Cessna 150 Airplane
110	322	2800	VV	0	30	Cessna 150 Airplane
111	347	2800	VV	+5	30	Cessna 150 Airplane
112	380	2800	VV	+10	30	Cessna 150 Airplane
113	490	2800	VV	-10	45	Cessna 150 Airplane
114	482	2800	VV	-5	45	Cessna 150 Airplane
115	415	2800	VV	0	45	Cessna 150 Airplane
116	436	2800	VV	+5	45	Cessna 150 Airplane
117	456	2800	VV	+10	45	Cessna 150 Airplane
118	59	2800	VV	N/A	N/A	Background with 0° roll, -10° pitch transitions
119	628	2800	VV	N/A	N/A	Background with 45° roll, -10° pitch transitions

CONTROL NUMBER 73-01 Table III DATA PLOT INDEX Sheet 4

PAGE NO.	RUN	FREQ (MHz)	POLARIZATION	PITCH ANGLE	ROLL ANGLE	TARGET CONFIGURATION AND REMARKS
120	45	2800	RR	-10	0	Cessna 150 Airplane
121	29	2800	RR	-5	0	Cessna 150 Airplane
122	22	2800	RR	0	0	Cessna 150 Airplane
123	75	2800	RR	+5	0	Cessna 150 Airplane
124	82	2800	RR	+10	0	Cessna 150 Airplane
125	117	2800	RR	-10	5	Cessna 150 Airplane
126	110	2800	RR	-5	5	Cessna 150 Airplane
127	125	2800	RR	0	5	Cessna 150 Airplane
128	96	2800	RR	+5	5	Cessna 150 Airplane
129	89	2800	RR	+10	5	Cessna 150 Airplane
130	160	2800	RR	-10	10	Cessna 150 Airplane
131	145	2800	RR	-5	10	Cessna 150 Airplane
132	138	2800	RR	0	10	Cessna 150 Airplane
133	180	2800	RR	+5	10	Cessna 150 Airplane
134	209	2800	RR	+10	10	Cessna 150 Airplane
135	306	2800	RR	-10	20	Cessna 150 Airplane
136	299	2800	RR	-5	20	Cessna 150 Airplane
137	258	2800	RR	0	20	Cessna 150 Airplane
138	278	2800	RR	+5	20	Cessna 150 Airplane
139	285	2800	RR	+10	20	Cessna 150 Airplane
140	393	2800	RR	-10	30	Cessna 150 Airplane
141	386	2800	RR	-5	30	Cessna 150 Airplane
142	323	2800	RR	0	30	Cessna 150 Airplane
143	330	2800	RR	+5	30	Cessna 150 Airplane
144	379	2800	RR	+10	30	Cessna 150 Airplane
145	489	2800	RR	-10	+5	Cessna 150 Airplane
146	484	2800	RR	-5	+5	Cessna 150 Airplane
147	414	2800	RR	0	+5	Cessna 150 Airplane
148	435	2800	RR	+5	+5	Cessna 150 Airplane
149	469	2800	RR	+10	+5	Cessna 150 Airplane
150	61	2800	RR	N/A	N/A	Background with 0° roll, -10° pitch transitions
151	629	2800	RR	N/A	N/A	Background with +5° roll, -10° pitch transitions

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CONTROL NUMBER 73-31 Table IX DATA PLOT INDEX Sheet 5

PAGE NO.	RUN	FREQ (MHz)	POLARIZATION	PITCH ANGLE	ROLL ANGLE	TARGET CONFIGURATION AND REMARKS
152	47	2800	HH	-10	0	Cessna 150 Airplane
153	28	2800	HH	-5	0	Cessna 150 Airplane
154	21	2800	HH	0	0	Cessna 150 Airplane
155	73	2800	HH	+5	0	Cessna 150 Airplane
156	84	2800	HH	+10	0	Cessna 150 Airplane
157	119	2800	HH	-10	5	Cessna 150 Airplane
158	112	2800	HH	-5	5	Cessna 150 Airplane
159	126	2800	HH	0	5	Cessna 150 Airplane
160	98	2800	HH	+5	5	Cessna 150 Airplane
161	91	2800	HH	+10	5	Cessna 150 Airplane
162	162	2800	HH	-10	10	Cessna 150 Airplane
163	147	2800	HH	-5	10	Cessna 150 Airplane
164	140	2800	HH	0	10	Cessna 150 Airplane
165	182	2800	HH	+5	10	Cessna 150 Airplane
166	211	2800	HH	+10	10	Cessna 150 Airplane
167	320	2800	HH	-10	20	Cessna 150 Airplane
168	301	2800	HH	-5	20	Cessna 150 Airplane
169	260	2800	HH	0	20	Cessna 150 Airplane
170	280	2800	HH	-	20	Cessna 150 Airplane
171	287	2800	HH	+10	20	Cessna 150 Airplane
172	395	2800	HH	-10	30	Cessna 150 Airplane
173	388	2800	HH	-5	30	Cessna 150 Airplane
174	321	2800	HH	0	30	Cessna 150 Airplane
175	348	2800	HH	+5	30	Cessna 150 Airplane
176	381	2800	HH	+10	30	Cessna 150 Airplane
177	491	2800	HH	-10	45	Cessna 150 Airplane
178	483	2800	HH	-5	45	Cessna 150 Airplane
179	416	2800	HH	0	45	Cessna 150 Airplane
180	437	2800	HH	+5	45	Cessna 150 Airplane
181	457	2800	HH	+10	45	Cessna 150 Airplane
182	60	2800	HH	N/A	N/A	Background with 0° roll, -10° pitch transitions
183	630	2800	HH	N/A	N/A	Background with 45° roll, -10° pitch transitions

CONTROL NUMBER 73-01

DATA PLOT INDEX

Sheet 6

Table III

PAGE NO.	RUN	FREQ (MHz)	POLARIZATION	PITCH ANGLE	ROLL ANGLE	TARGET CONFIGURATION AND REMARKS
184	43	2900	VV	-10	0	Cessna 150 Airplane
185	31	2900	VV	-5	0	Cessna 150 Airplane
186	18	2900	VV	0	0	Cessna 150 Airplane
187	77	2900	VV	+5	0	Cessna 150 Airplane
188	86	2900	VV	+10	0	Cessna 150 Airplane
189	121	2900	VV	-10	5	Cessna 150 Airplane
190	108	2900	VV	-5	5	Cessna 150 Airplane
191	122	2900	VV	0	5	Cessna 150 Airplane
192	100	2900	VV	+5	5	Cessna 150 Airplane
193	87	2900	VV	+10	5	Cessna 150 Airplane
194	163	2900	VV	-10	10	Cessna 150 Airplane
195	143	2900	VV	-5	10	Cessna 150 Airplane
196	142	2900	VV	0	10	Cessna 150 Airplane
197	178	2900	VV	+5	10	Cessna 150 Airplane
198	207	2900	VV	+10	10	Cessna 150 Airplane
199	304	2900	VV	-10	20	Cessna 150 Airplane
200	303	2900	VV	-5	20	Cessna 150 Airplane
201	256	2900	VV	0	20	Cessna 150 Airplane
202	282	2900	VV	+5	20	Cessna 150 Airplane
203	283	2900	VV	+10	20	Cessna 150 Airplane
204	391	2900	VV	-10	30	Cessna 150 Airplane
205	389	2900	VV	-5	30	Cessna 150 Airplane
206	327	2900	VV	0	30	Cessna 150 Airplane
207	328	2900	VV	+5	30	Cessna 150 Airplane
208	377	2900	VV	+10	30	Cessna 150 Airplane
209	487	2900	VV	-10	45	Cessna 150 Airplane
210	486	2900	VV	-5	45	Cessna 150 Airplane
211	412	2900	VV	0	45	Cessna 150 Airplane
212	439	2900	VV	+5	45	Cessna 150 Airplane
213	440	2900	VV	+10	45	Cessna 150 Airplane
214	57	2900	VV	N/A	N/A	Background with 0° roll, -10° pitch transitions
215	626	2900	VV	N/A	N/A	Background with -15° roll, -10° pitch transitions

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CONTROL NUMBER 73-01

DATA PLOT INDEX

Sheet 7

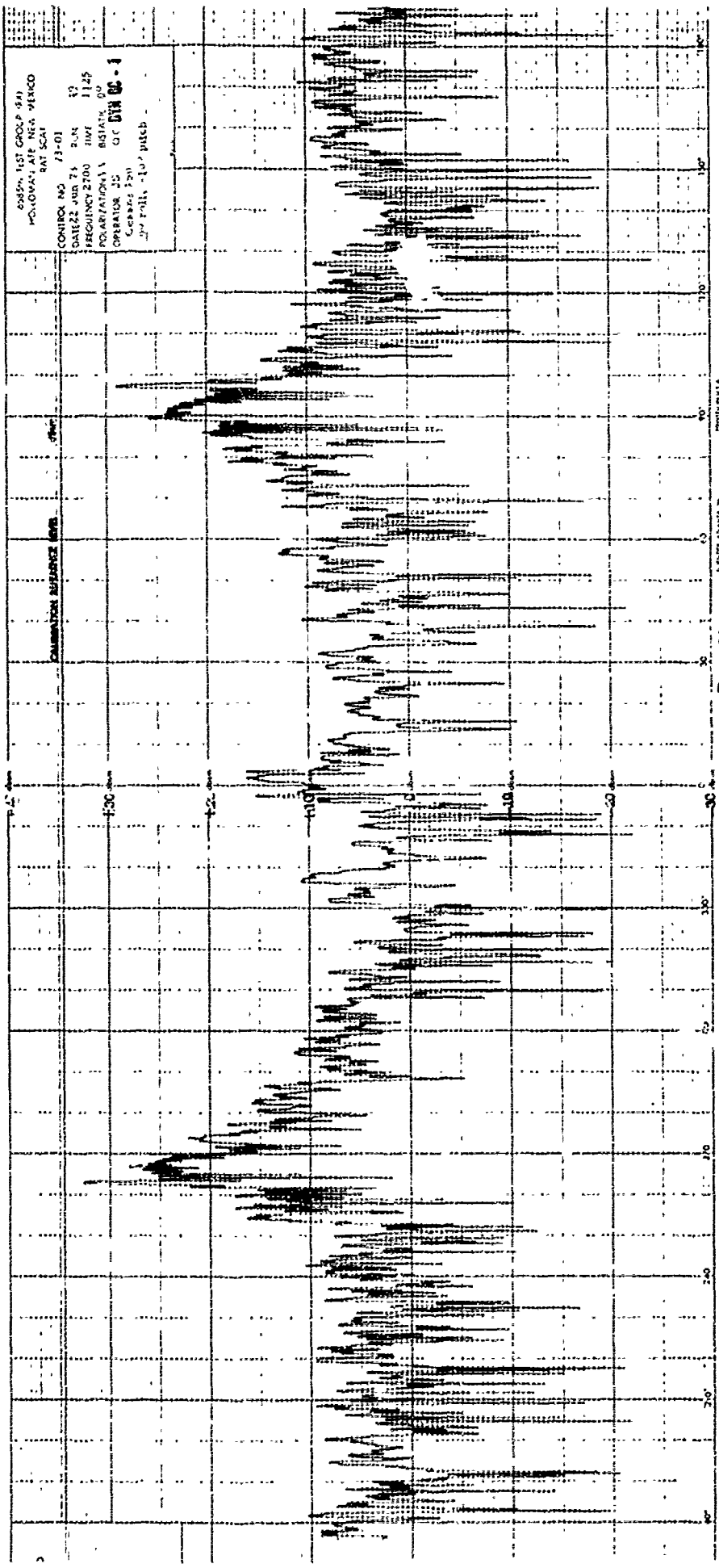
Tab 2 of 11

PAGE NO.	RUN	FREQ (MHz)	POLARIZATION	PITCH ANGLE	ROLL ANGLE	TARGET CONFIGURATION AND REMARKS
216	41	2900	RR	-10	0	Cessna 150 Airplane
217	30	2900	RR	-5	0	Cessna 150 Airplane
218	19	2900	RR	0	0	Cessna 150 Airplane
219	76	2900	RR	+5	0	Cessna 150 Airplane
220	85	2900	RR	+10	0	Cessna 150 Airplane
221	120	2900	RR	-10	5	Cessna 150 Airplane
222	109	2900	RR	-5	5	Cessna 150 Airplane
223	123	2900	RR	0	5	Cessna 150 Airplane
224	99	2900	RR	+5	5	Cessna 150 Airplane
225	88	2900	RR	+10	5	Cessna 150 Airplane
226	162	2900	RR	-10	10	Cessna 150 Airplane
227	141	2900	RR	-5	10	Cessna 150 Airplane
228	143	2900	RR	0	10	Cessna 150 Airplane
229	170	2900	RR	+5	10	Cessna 150 Airplane
230	208	2900	RR	+10	10	Cessna 150 Airplane
231	305	2900	RR	-10	20	Cessna 150 Airplane
232	302	2900	RR	-5	20	Cessna 150 Airplane
233	252	2900	RR	0	20	Cessna 150 Airplane
234	281	2900	RR	+5	20	Cessna 150 Airplane
235	284	2900	RR	+10	20	Cessna 150 Airplane
236	326	2900	RR	-10	30	Cessna 150 Airplane
237	390	2900	RR	-5	30	Cessna 150 Airplane
238	325	2900	RR	0	30	Cessna 150 Airplane
239	329	2900	RR	+5	30	Cessna 150 Airplane
240	329	2900	RR	+10	30	Cessna 150 Airplane
241	438	2900	RR	-10	45	Cessna 150 Airplane
242	485	2900	RR	-5	45	Cessna 150 Airplane
243	413	2900	RR	0	45	Cessna 150 Airplane
244	438	2900	RR	+5	45	Cessna 150 Airplane
245	441	2900	RR	+10	45	Cessna 150 Airplane
246	58	2900	RR	N/A	N/A	Background with 0° roll, -10° pitch transitions
247	627	2900	RR	N/A	N/A	Background with 350 roll, -10° pitch transitions

Table III

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ASSOCIATE GROUP (RHS)  
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SAT SAT

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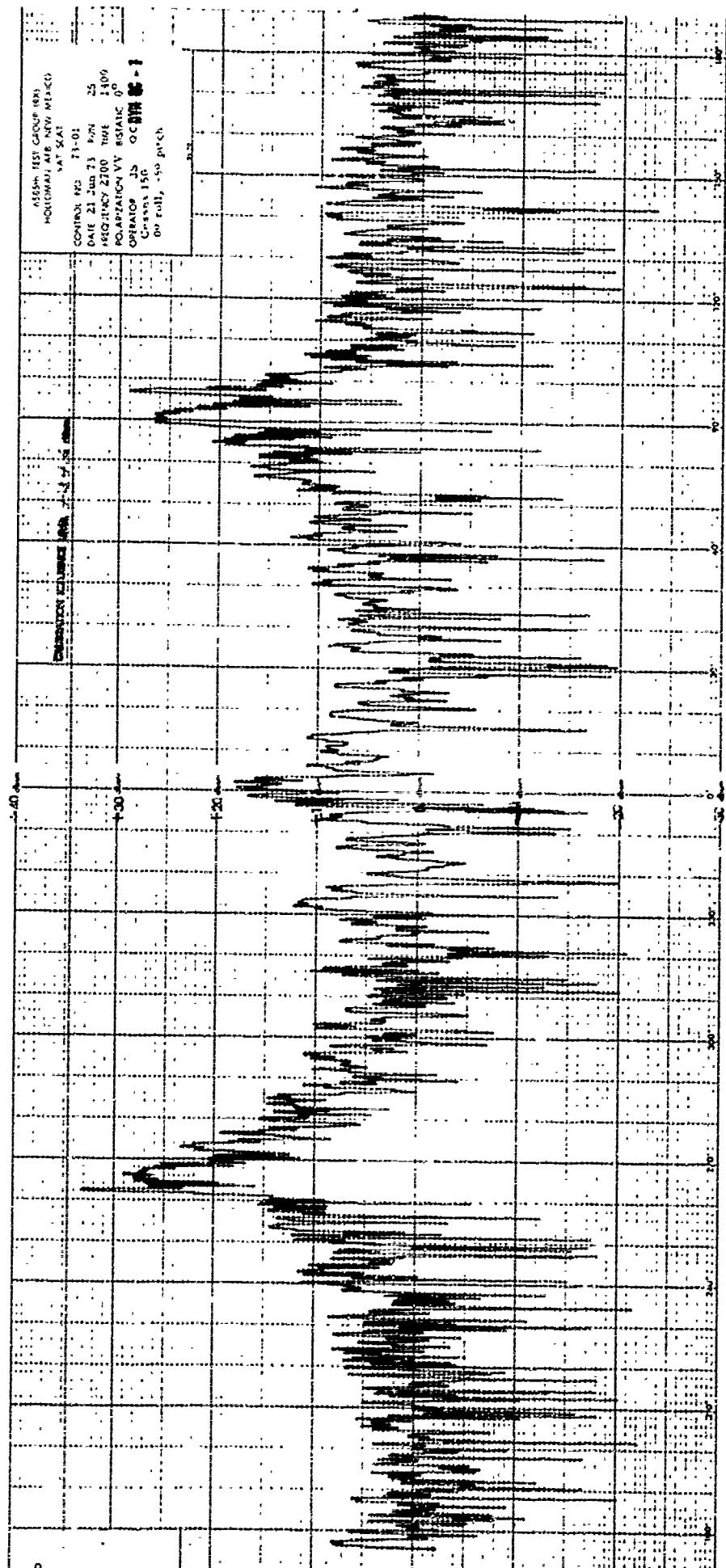
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Figure 1



ASUN TEST GROUP (F)  
MILITARY TEST GROUP  
241 541

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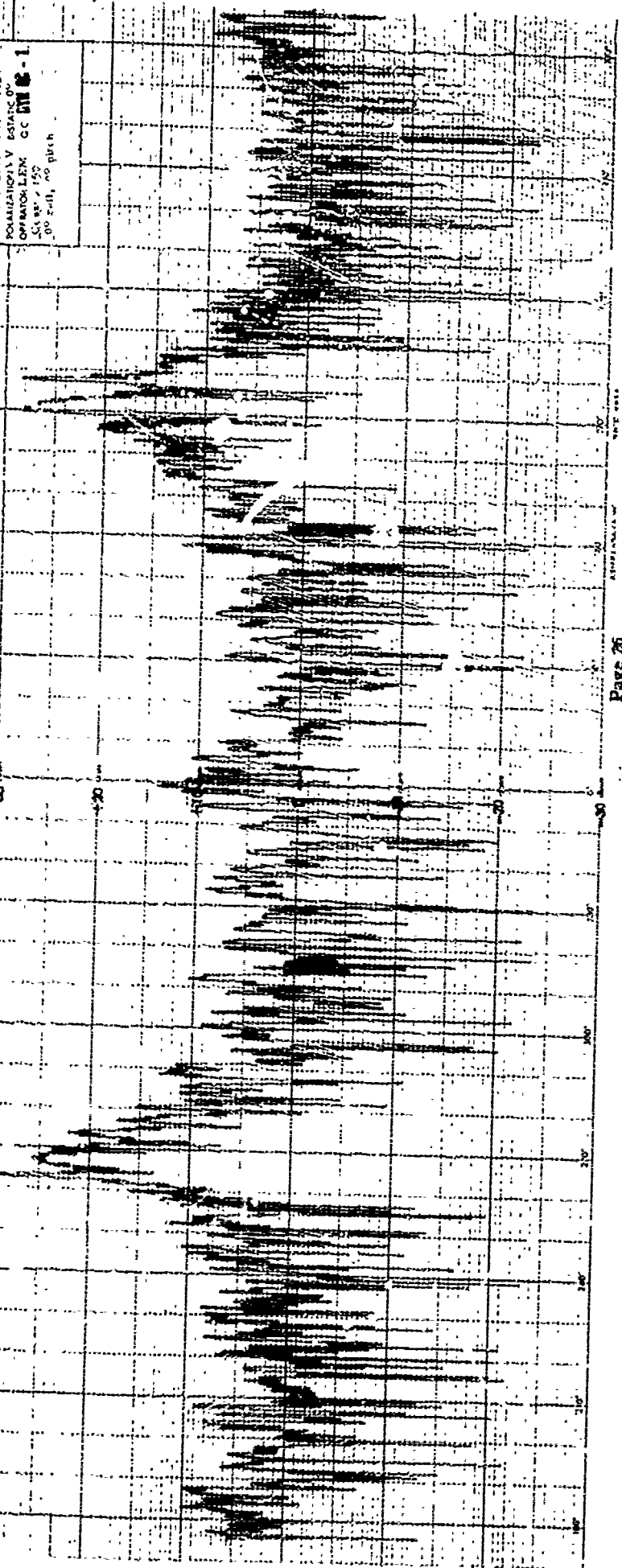
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POLARIZATION V ESTATIC 0°

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1925 1885

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CONFIDENTIAL NO 12-53

DATE 25 JUN 73 PAGE 116

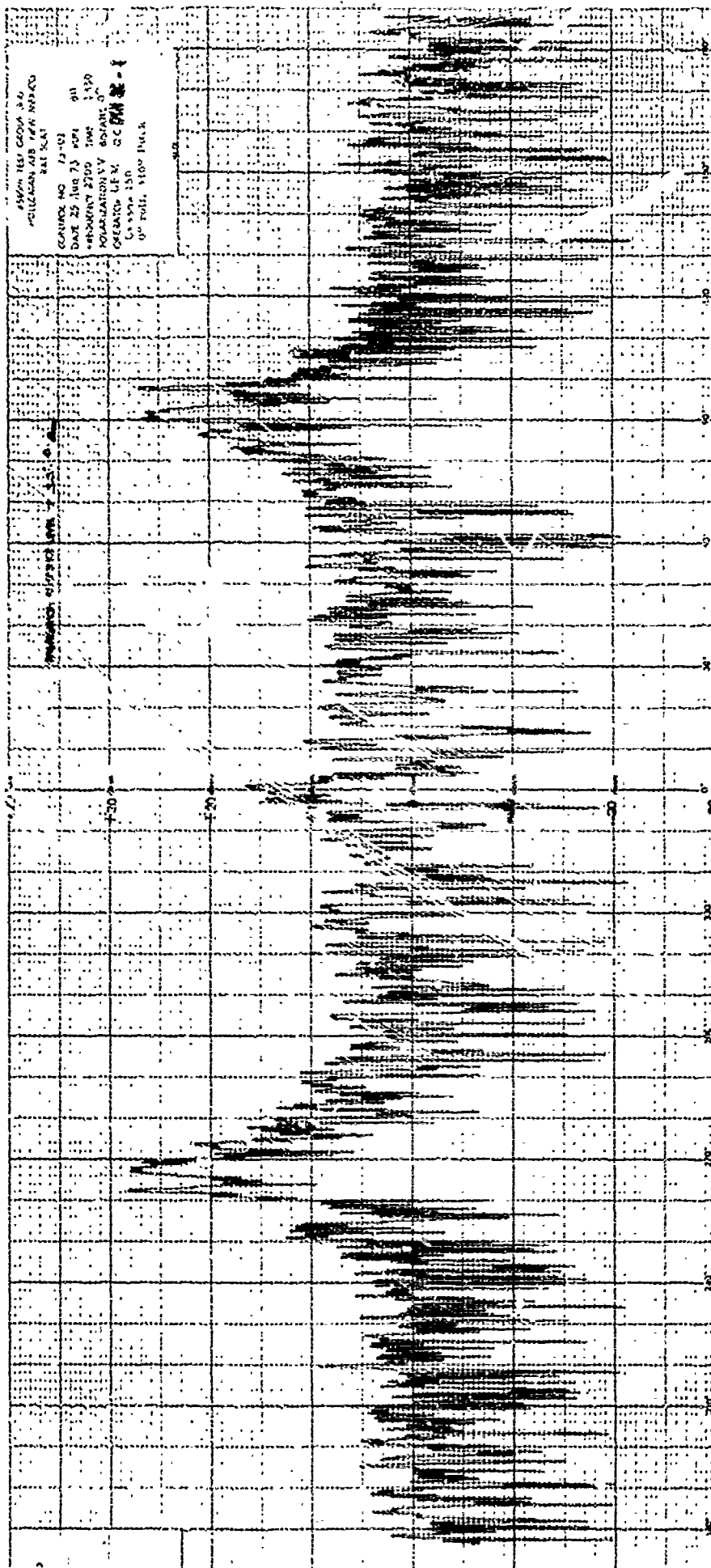
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FOR INFORMATION OF THE BOARD:

• 2000 年 11 月 17 日

6. 2000

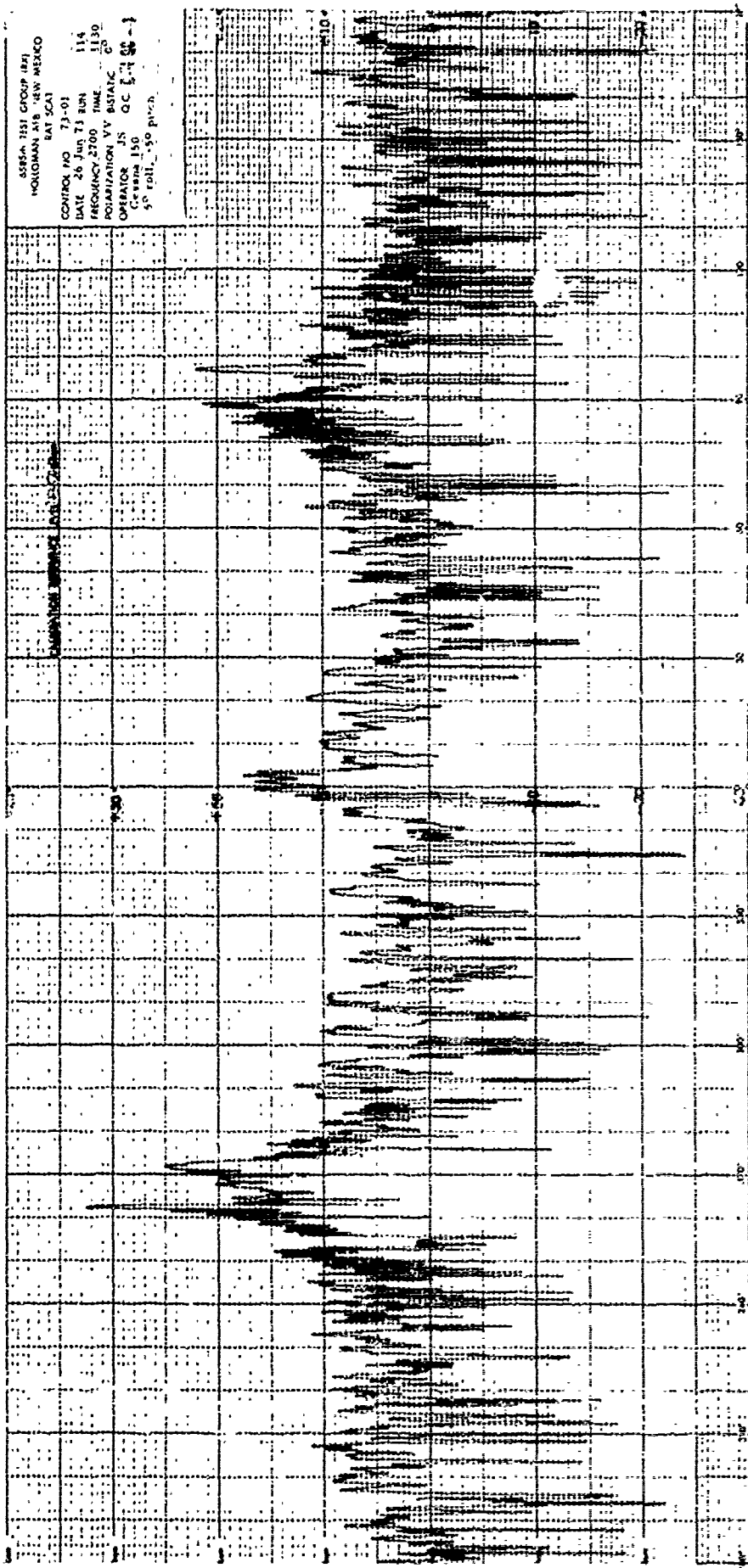
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65500 1ST GROUP (B)  
INSTRUMENT AIR NEW MARY  
441 541  
CONSOLE NO. 73-01 415  
DATE 26 JUN 55 424 1110  
FREQUENCY 2700 TUD 1110  
POTENTIAL VV 65100-00  
OPERATOR 35 121 610 62-3  
1.0000 150  
40 dB, -100 dB

CALIBRATION RECORD

5555A TEST GROUP (B)  
 HOLLOMAN AFB NEW MEXICO  
 EAT SCAT  
 CONTROL NO 73-01  
 DATE 26 Jun 73 RUN 114  
 FREQUENCY 2700 TIME 1130  
 POLARIZATION VV BISTATIC  
 OPERATOR JS OC 5-7-73  
 Gersma 150  
 50 roll, 50 pitch







[illegible]

ASSUM. TEST GROUP. BY:  
HOSIUMAY, AIA "NEW MEXICO"  
RAI 5, A1

CONTR. NO. 73-01

DATE 25 JUN 73 7:47 92

FREQUENCY 2700 HMT 1810

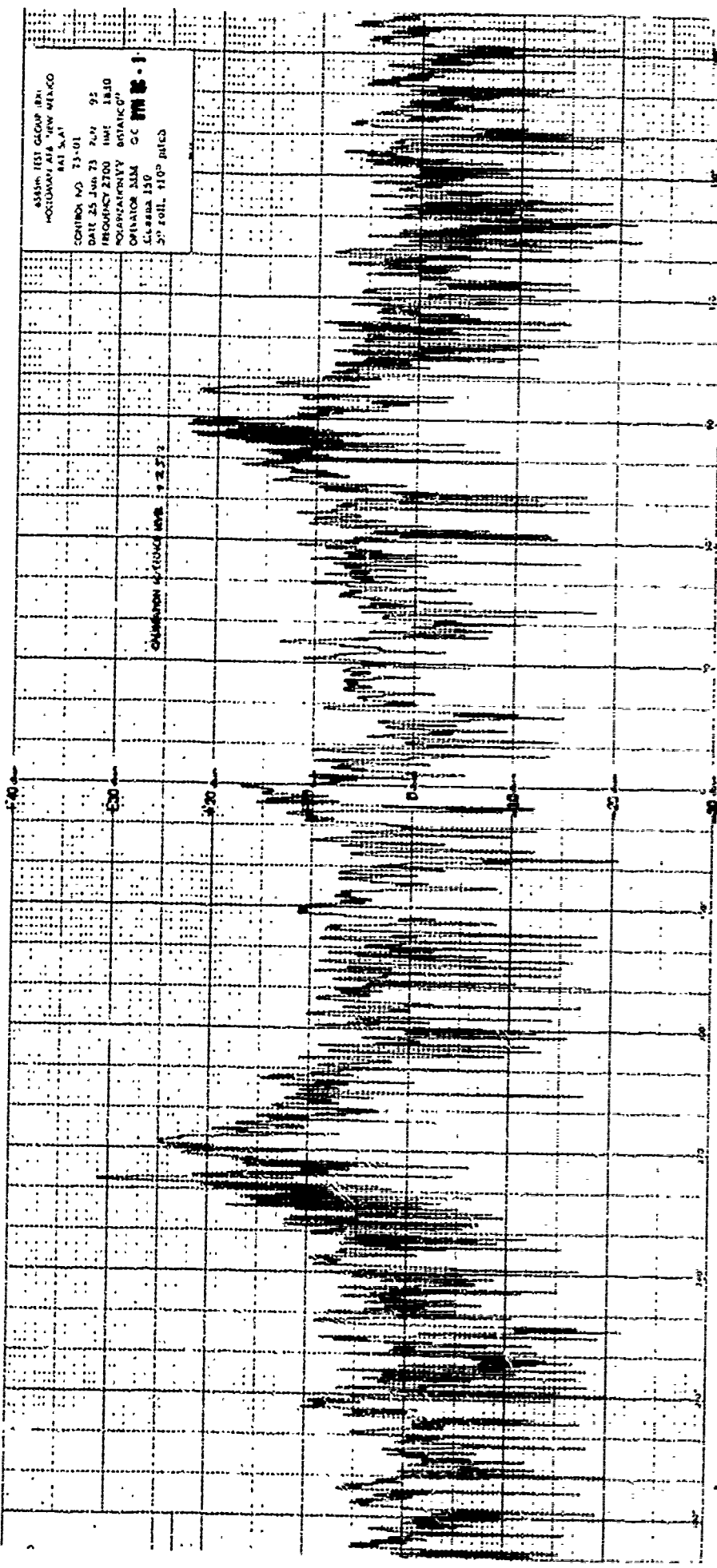
MODIFICATION BY "BATECO"

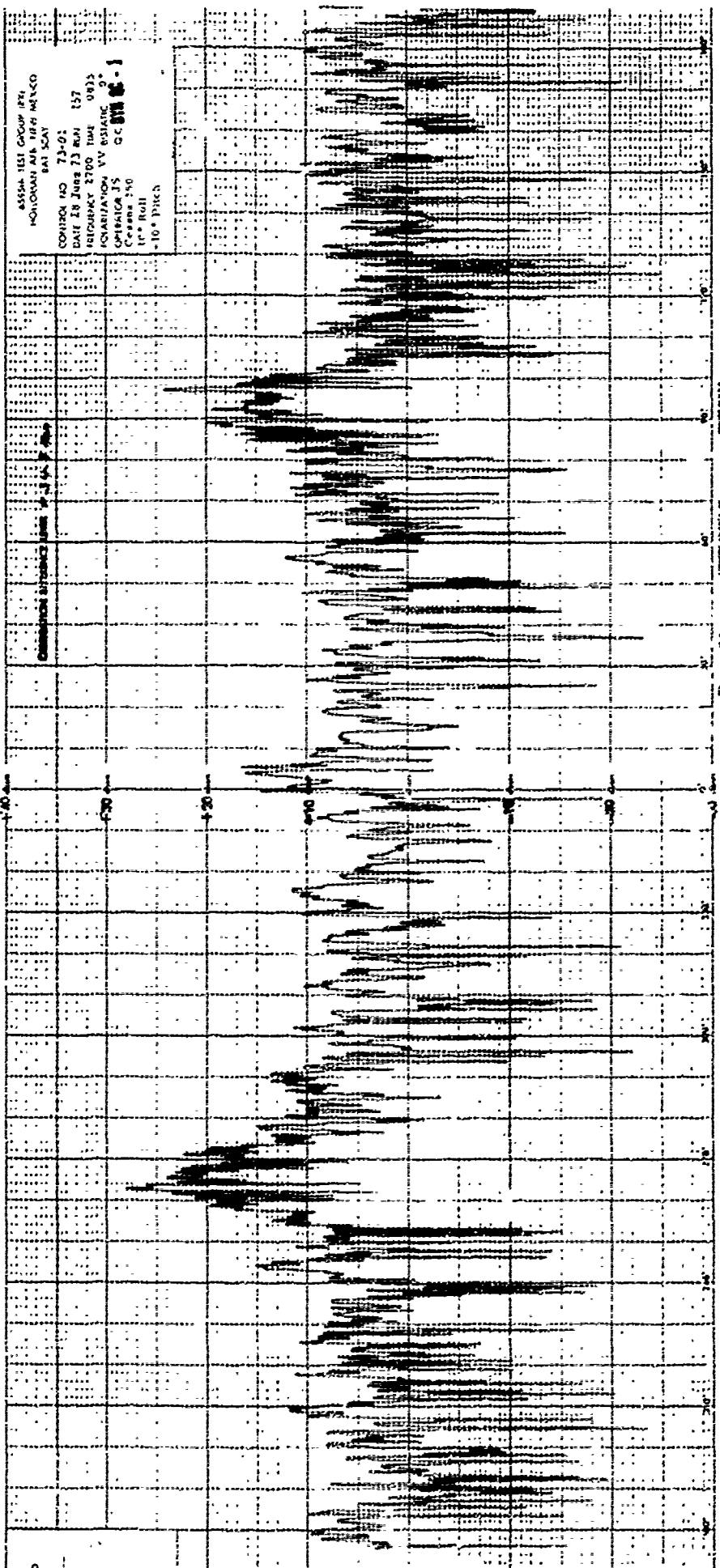
OPERATOR ALM CC 000000-1

CLASS 150

2nd roll, 110° RUCS

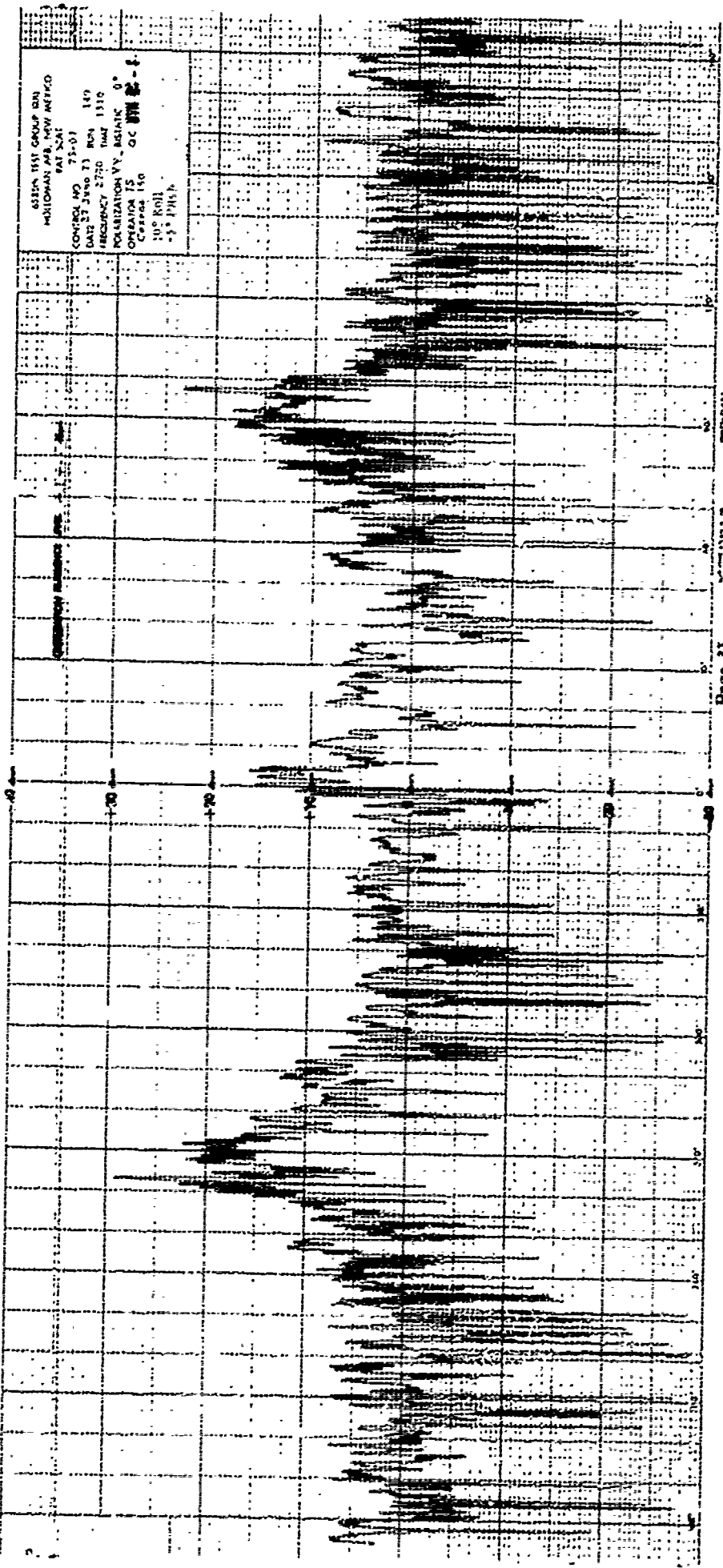
CHARTERED 4/20/68 110° RUCS

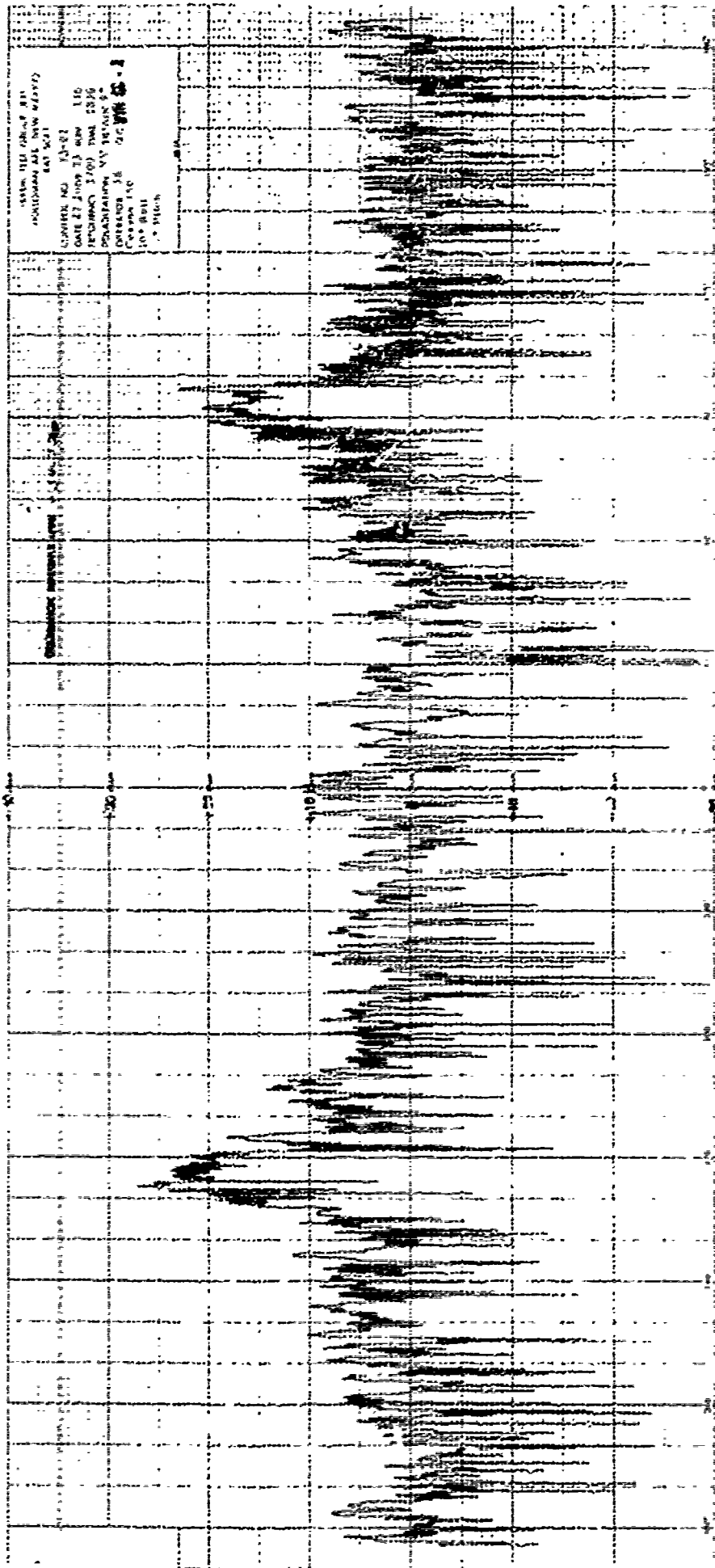




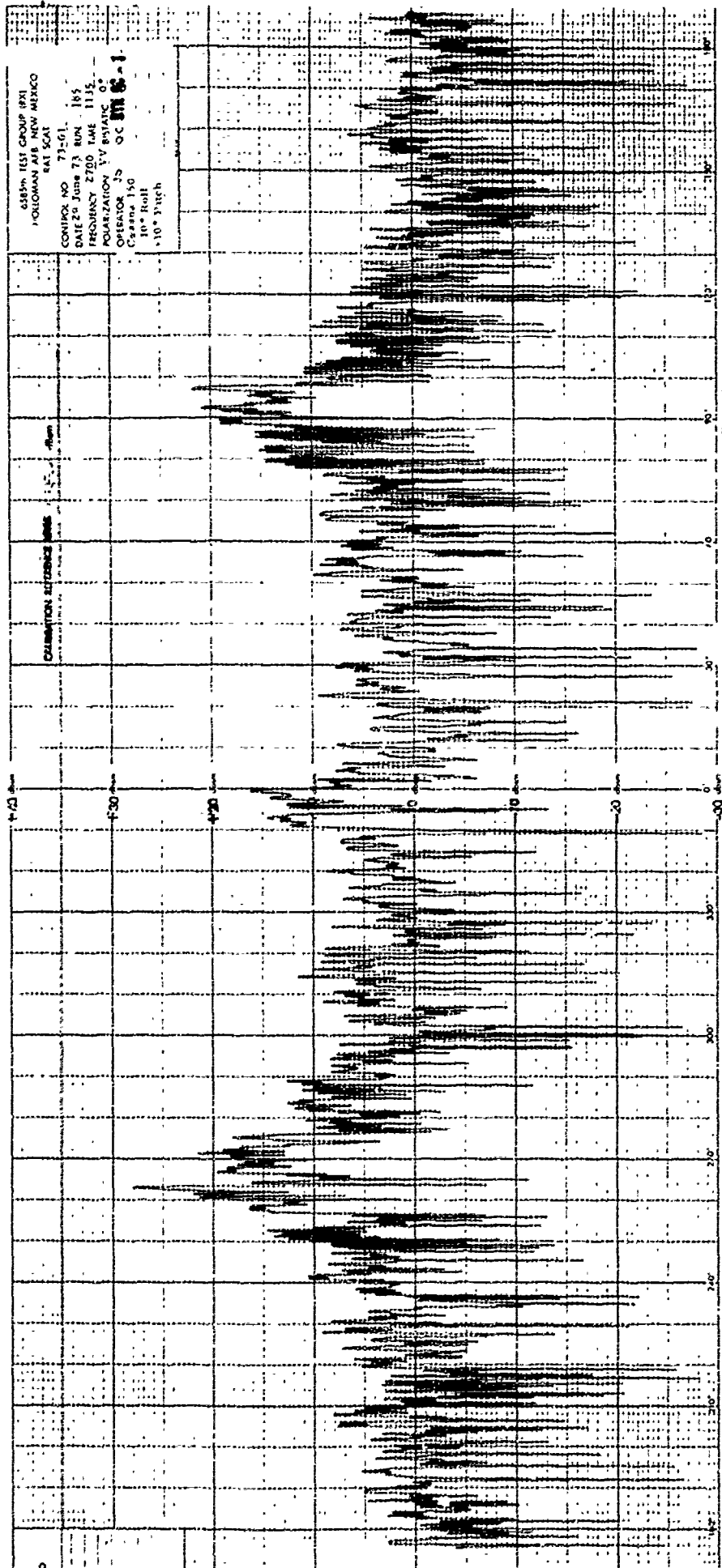
ASSAULT TEST GROUP 171  
HOLLOMAN AIR FIELD, NEW MEXICO  
BAT SCAT  
CONTINENT NO 73-01  
DATE 28 June 73 RAN 157  
REQUIREMENT 1700 TIME 0815  
OPERATION VV BULBAC 9  
OPERATOR J.S. G. 811 6-1  
Crewman 150  
1st Roll  
-10° Pitch

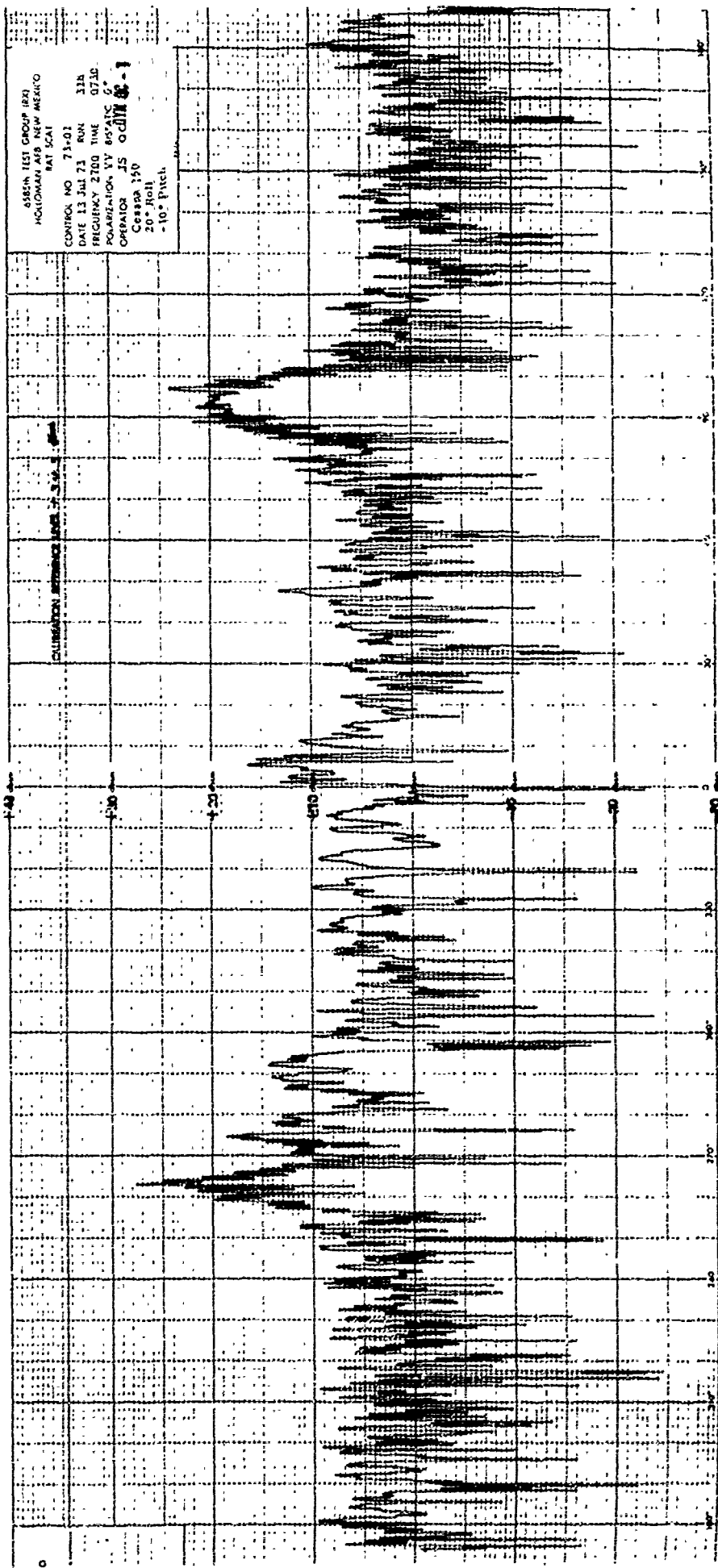
GREEN TEST GROUP (24)  
MILITARY AIR, NEW MEXICO  
FAT NO. 1  
CONTROL NO. 75-01  
DATE 27 June 73 RUN 149  
FREQUENCY 2750 MHz 1310  
POLARIZATION VV, AZIMUTH 0°  
OPERATOR TS  
CROSSING 110  
10° Roll  
-5° Pitch



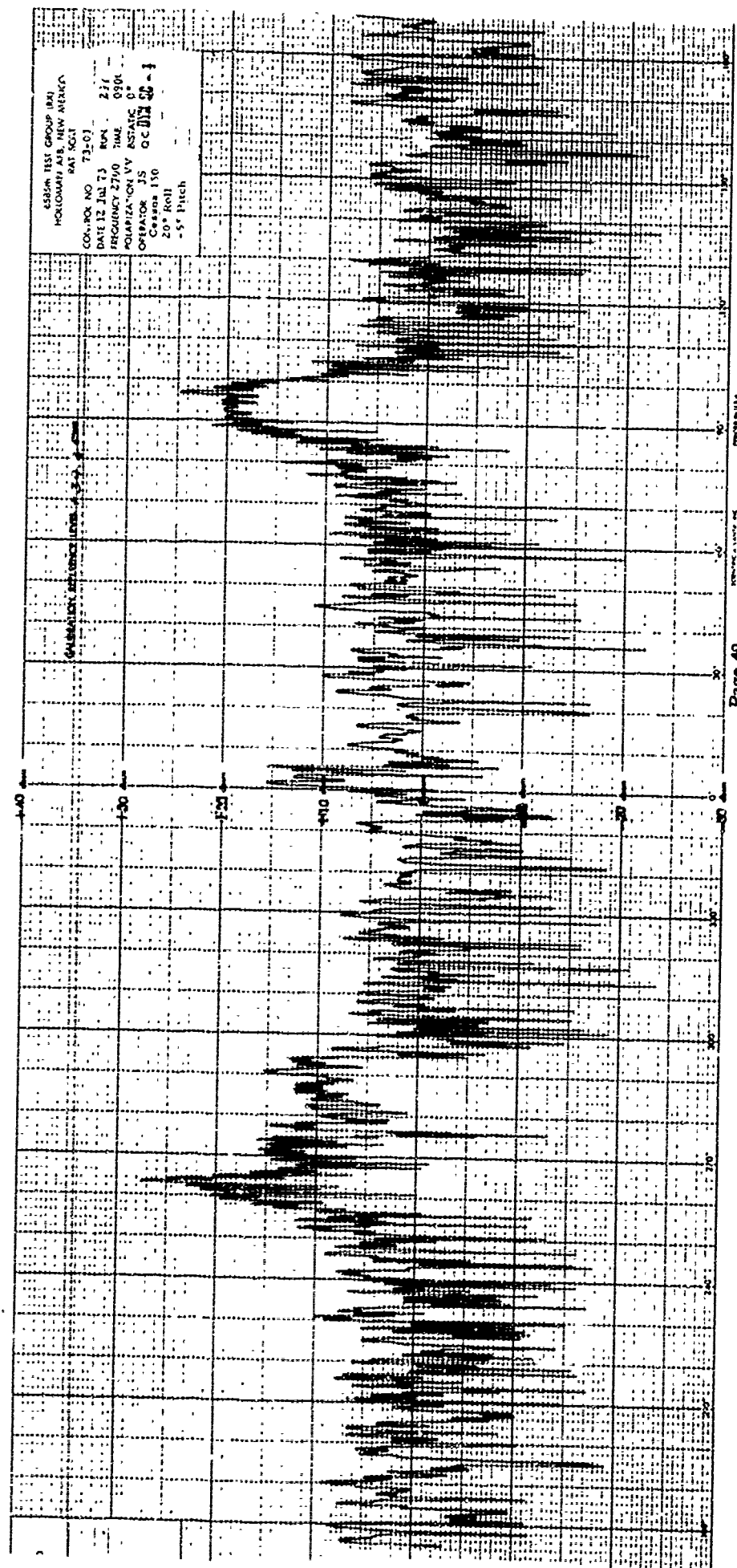


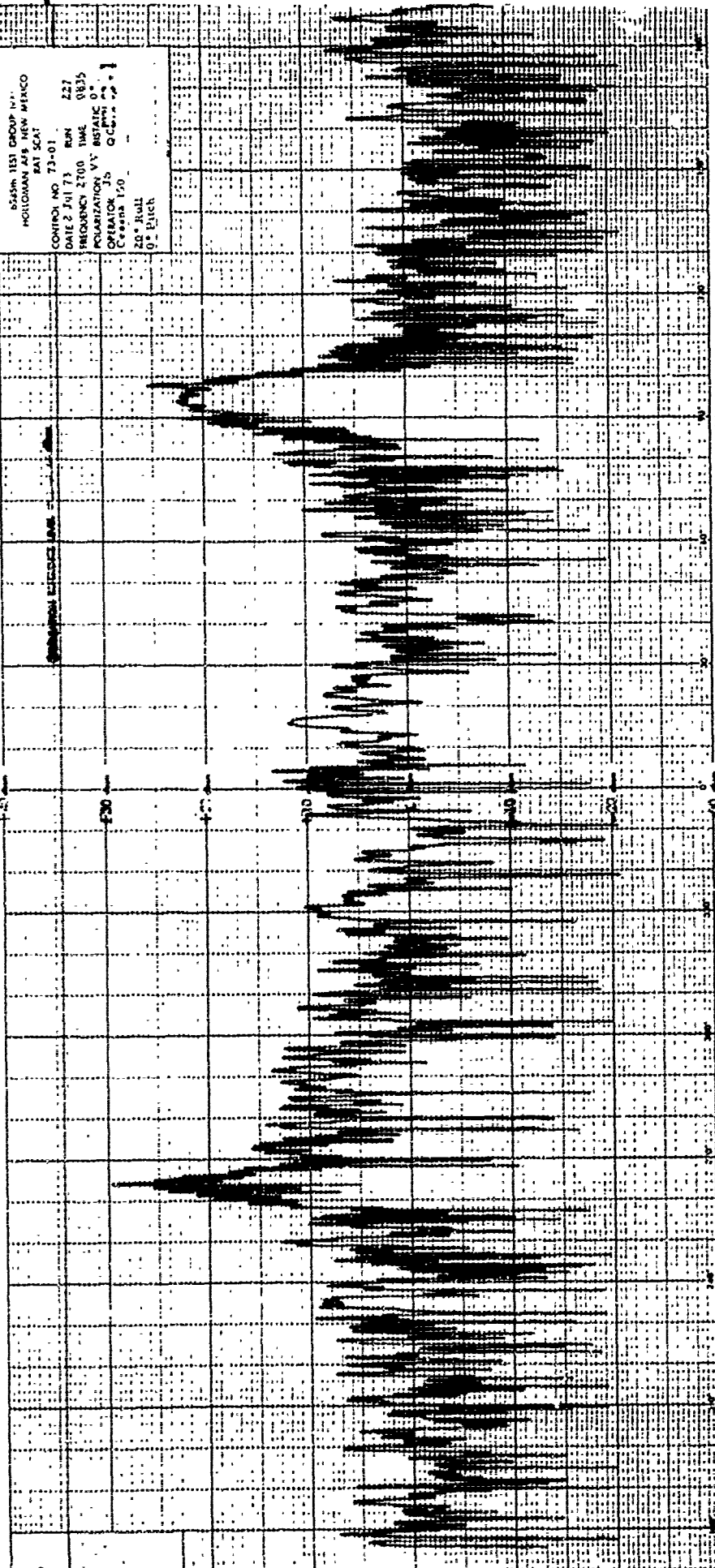
3554-151 GROSS "1"  
 MOUNTAIN VIEW, MEXICO  
 RAI SCA  
 CONTROLS 100 73-01  
 DATE 25 June 75 RUN 184  
 FREQUENCY 2700 TIME 0930  
 POLARIZATION V.V. INSTANT. D.  
 OPERATOR TS OC DYN BC - J  
 Cassini 150  
 10" Roll  
 1-4 Pitch











ASSN. TEST GROUP (V)  
HOLCOMB AIR FWD MIKCO  
BAT SCAT

CONTROL NO 71-01

DATE 11 Jul 73

FREQ 276

TIME 1005

POLARIZATION V

ORBITAL 0°

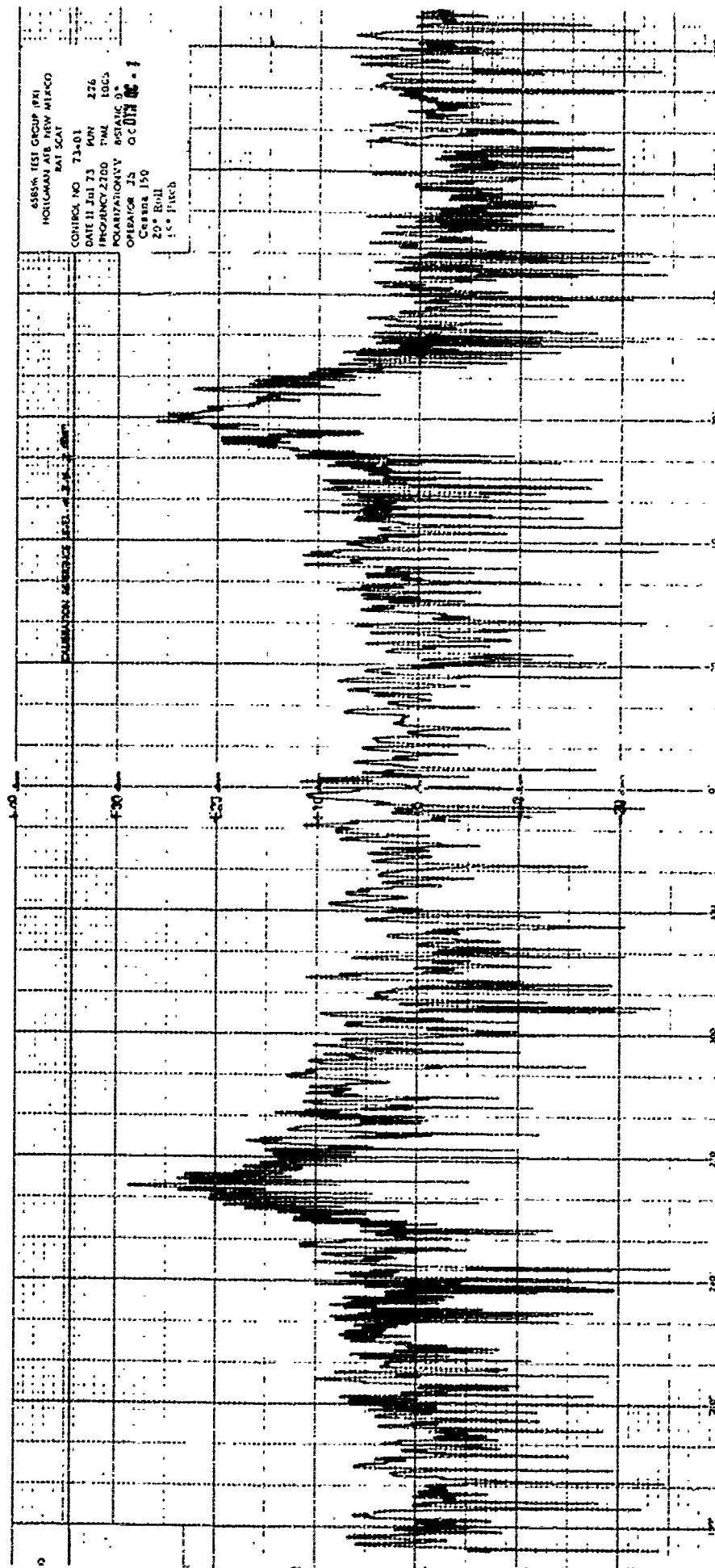
OPERATOR JS

Cessna 150

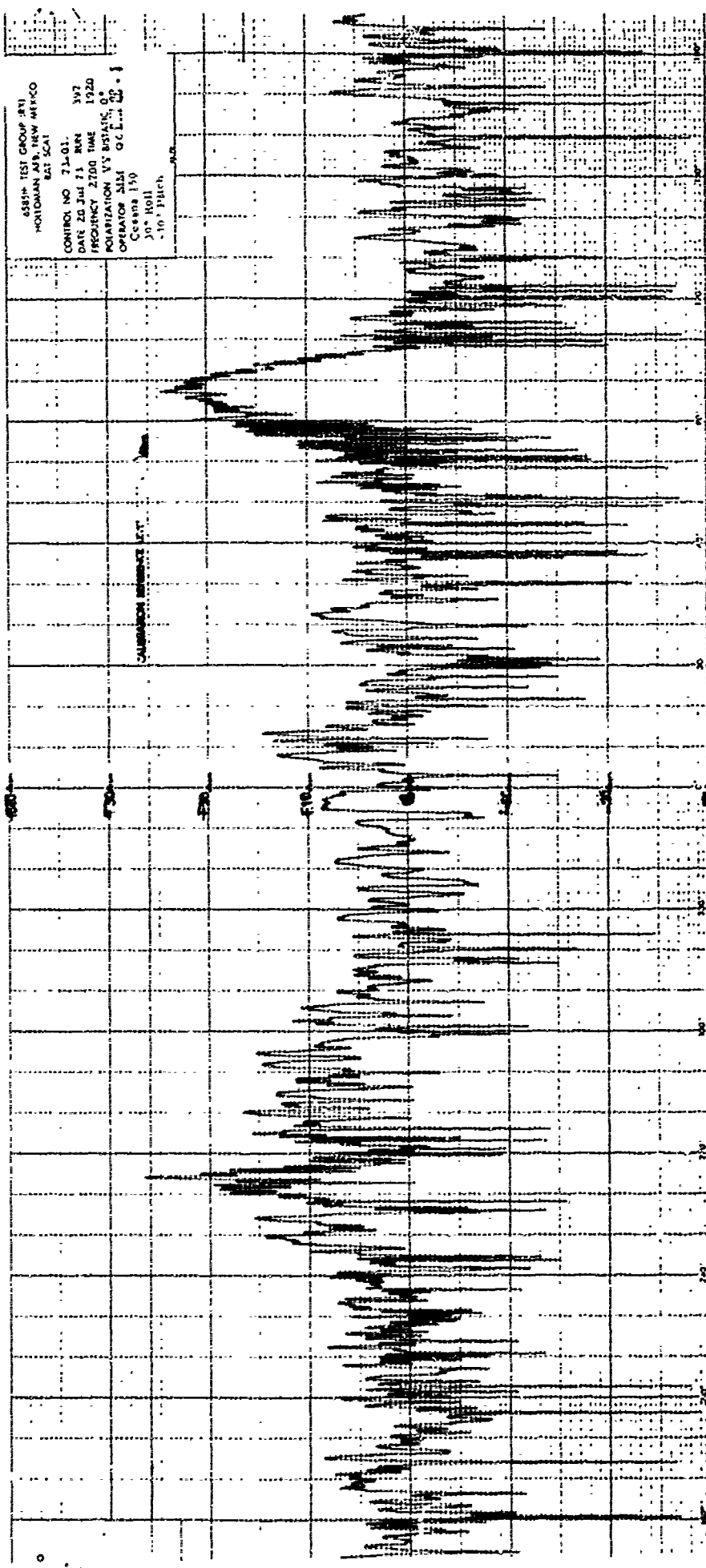
29° Roll

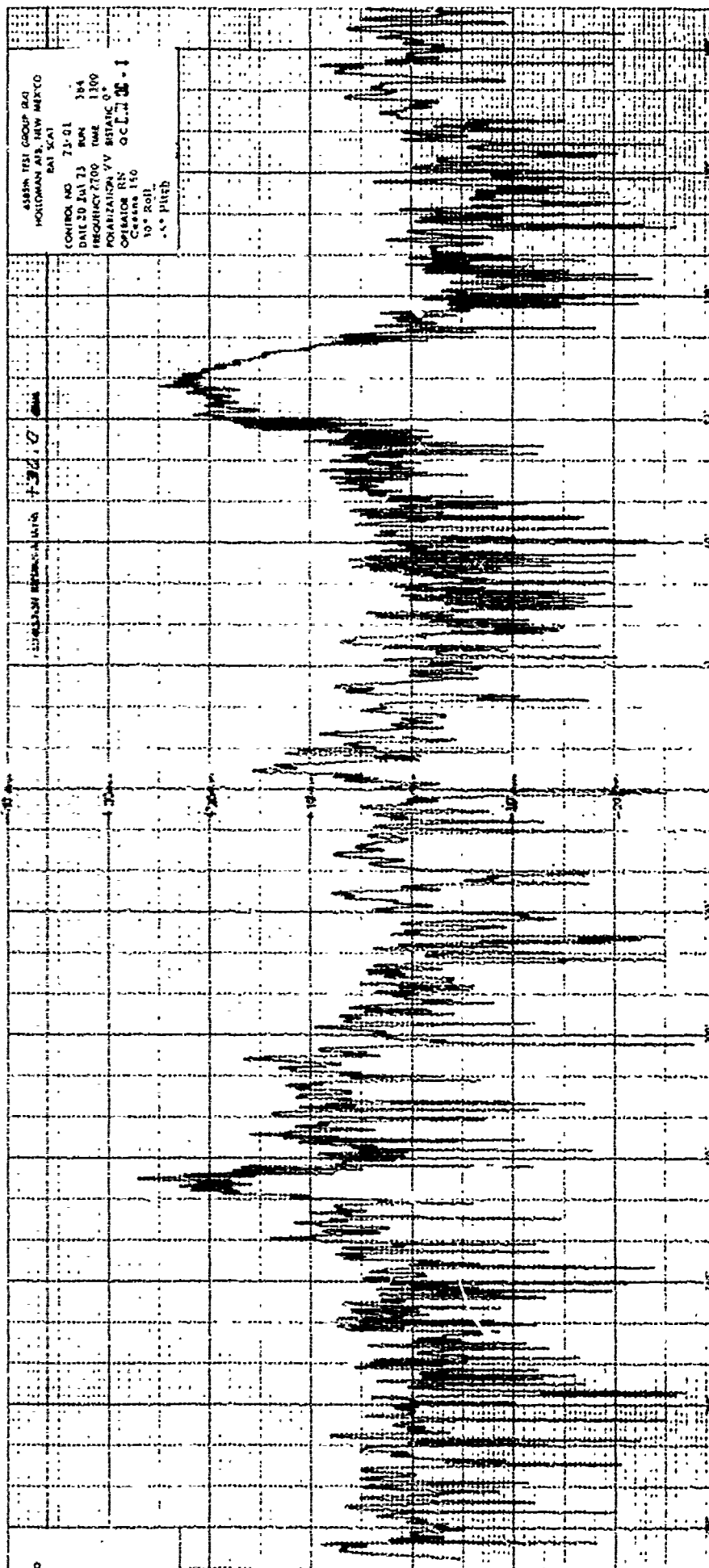
15° Pitch

QC 017 00-1





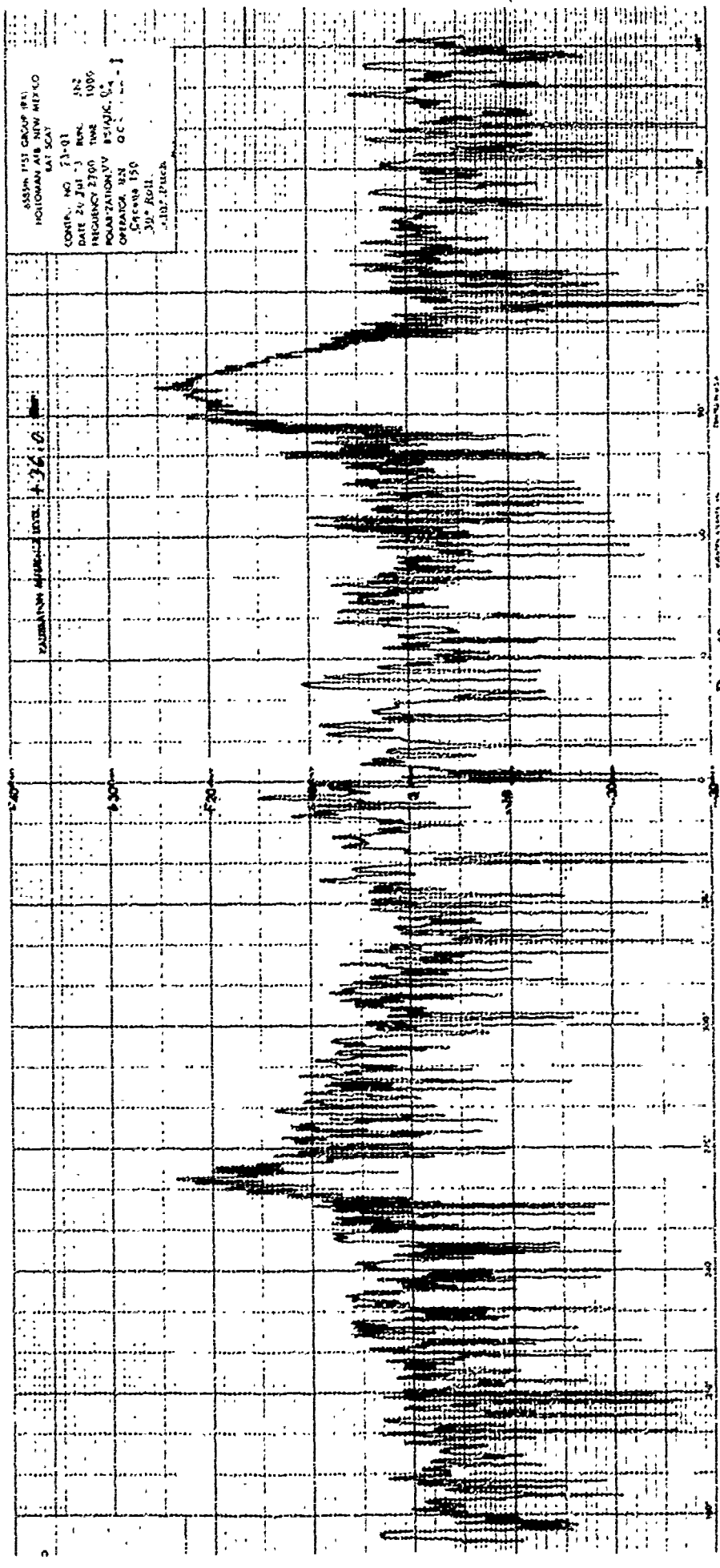






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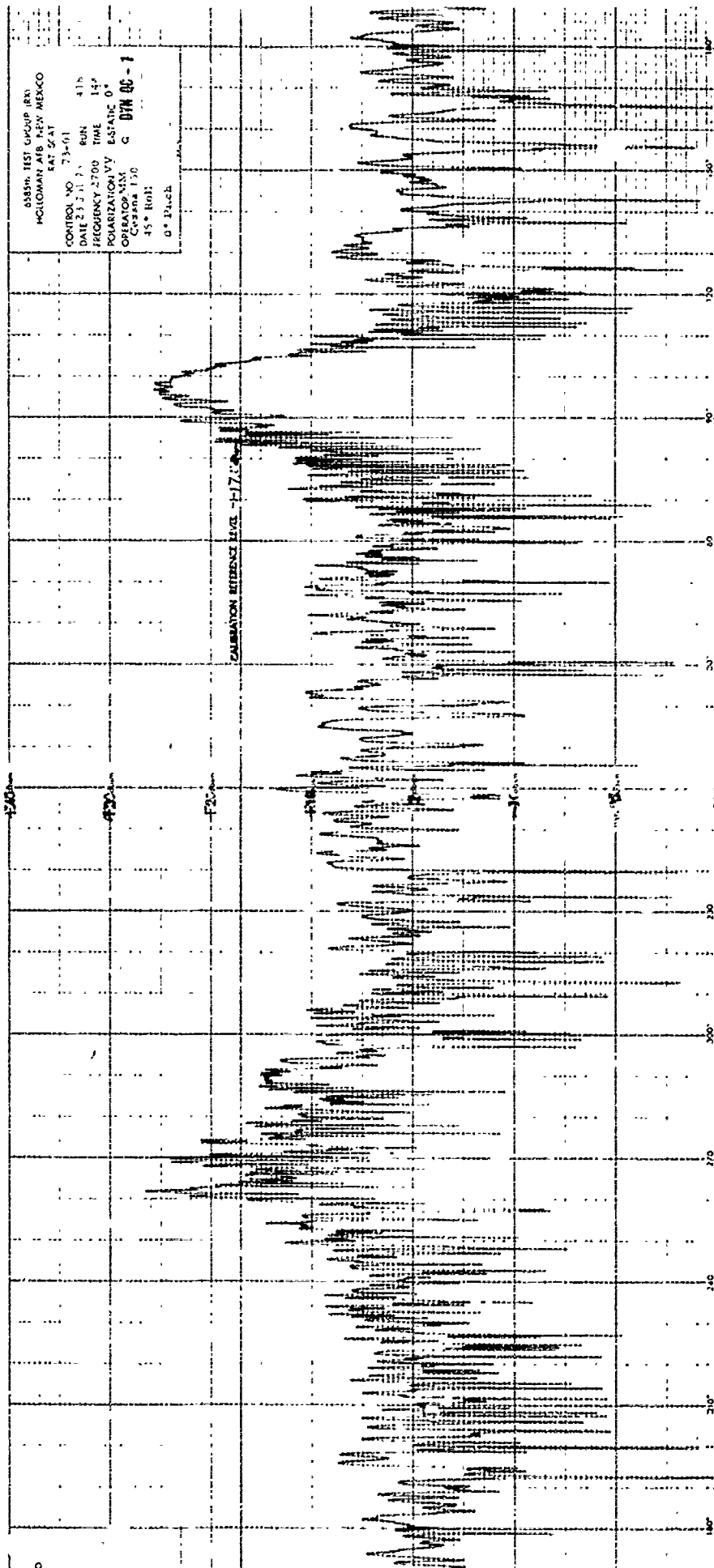


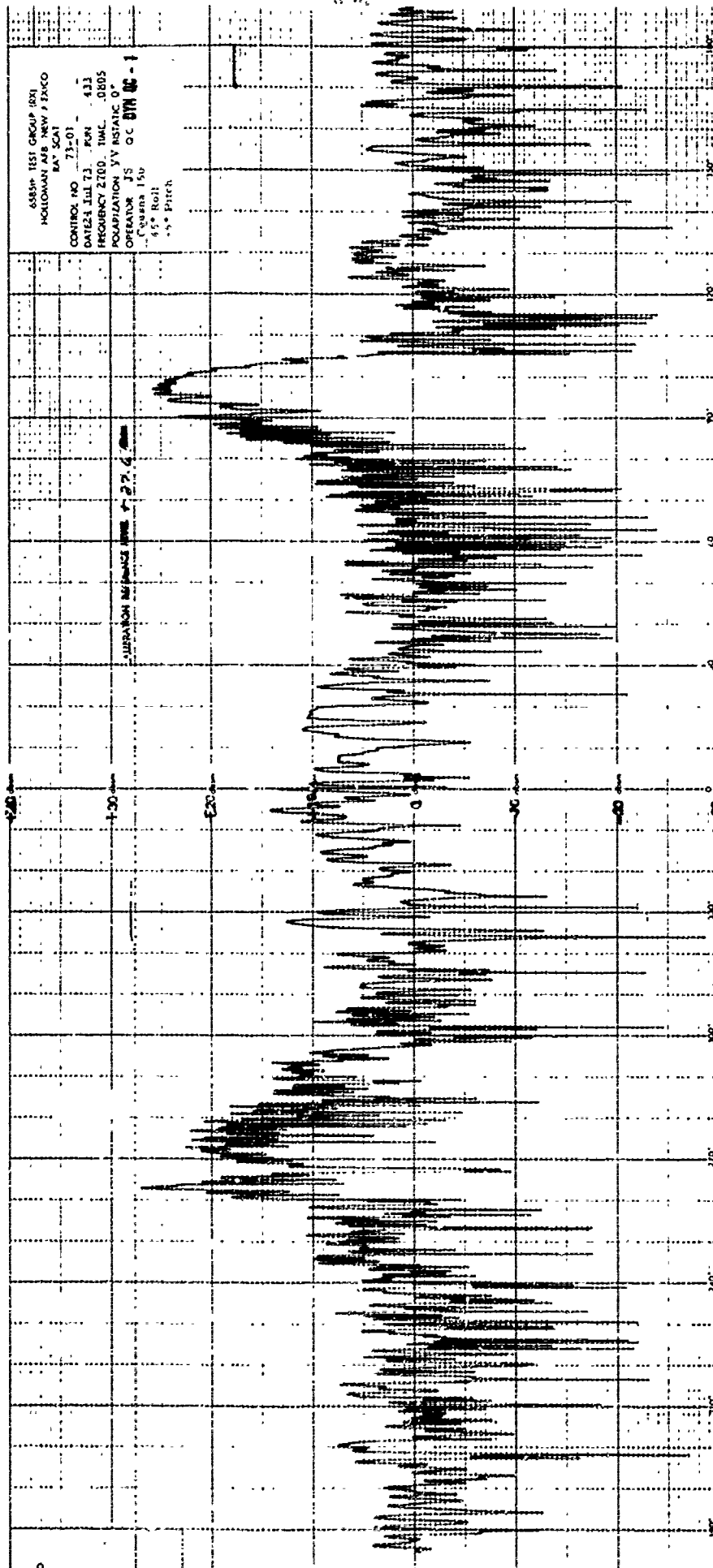


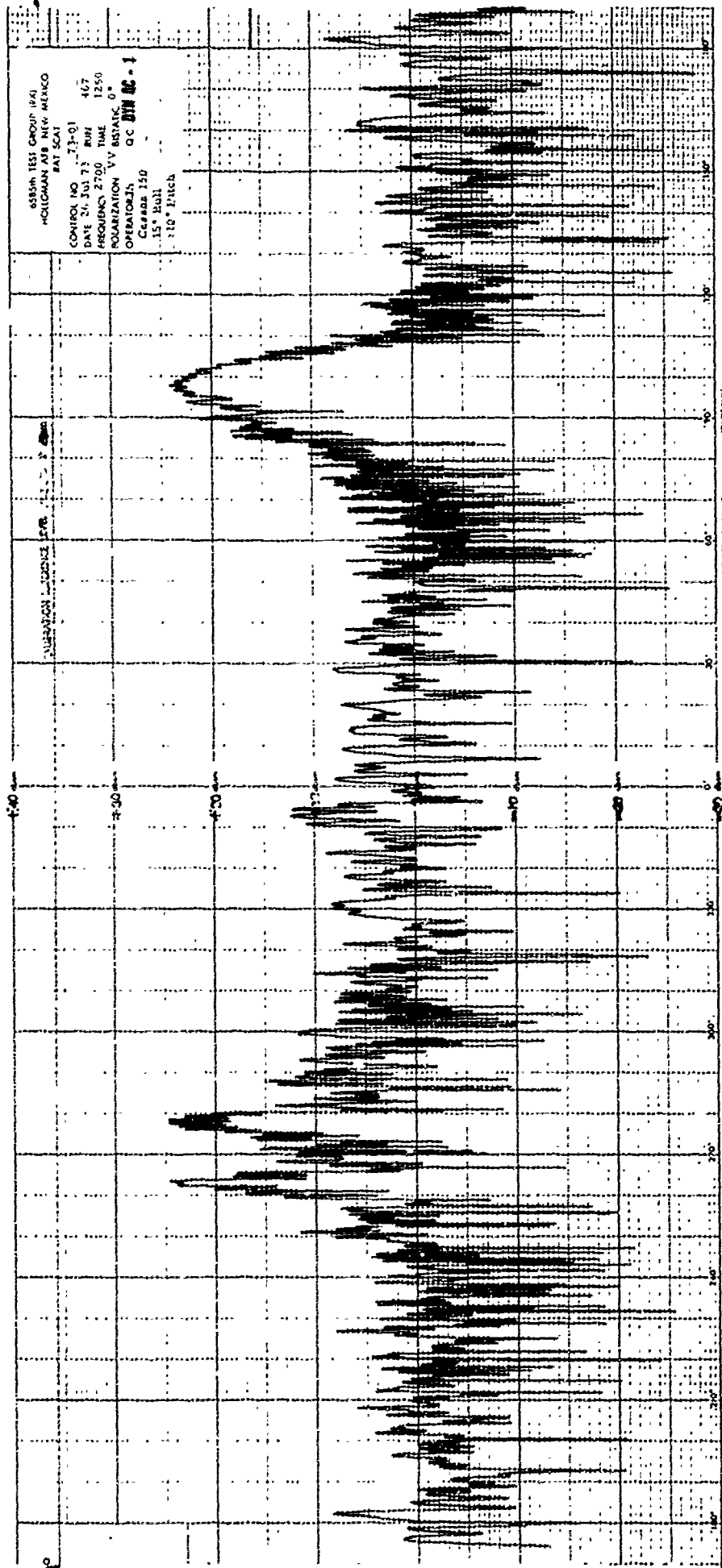
ASSON 1ST GROUP (R1)  
HOLLAND AIR NEW MEXICO  
EAT SCAY  
CONF. NO. 71-01  
DATE 20 JUL 60  
FREQUENCY 2300 MHz  
POLARIZATION VV  
OPERATOR UN  
Crews 150  
30° Roll  
-102° Pitch

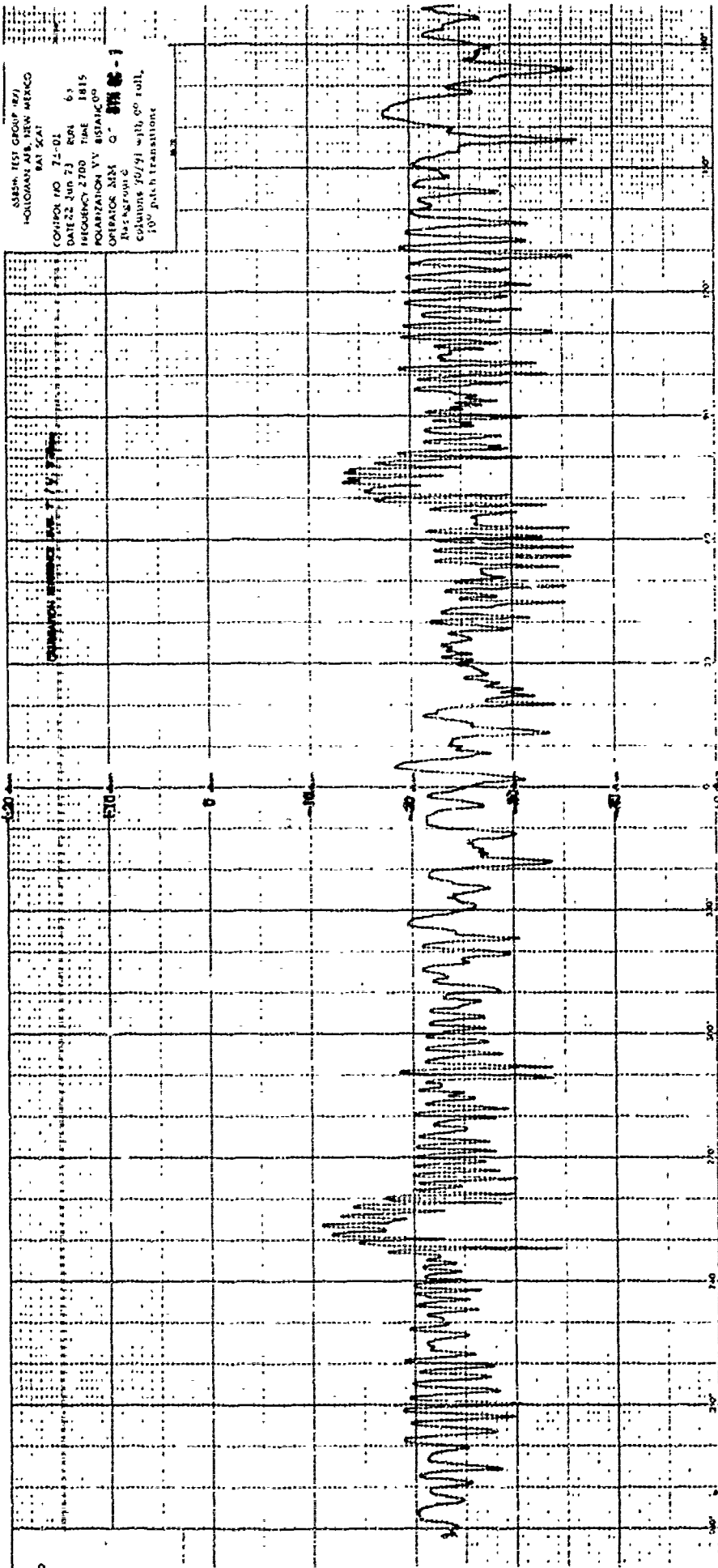


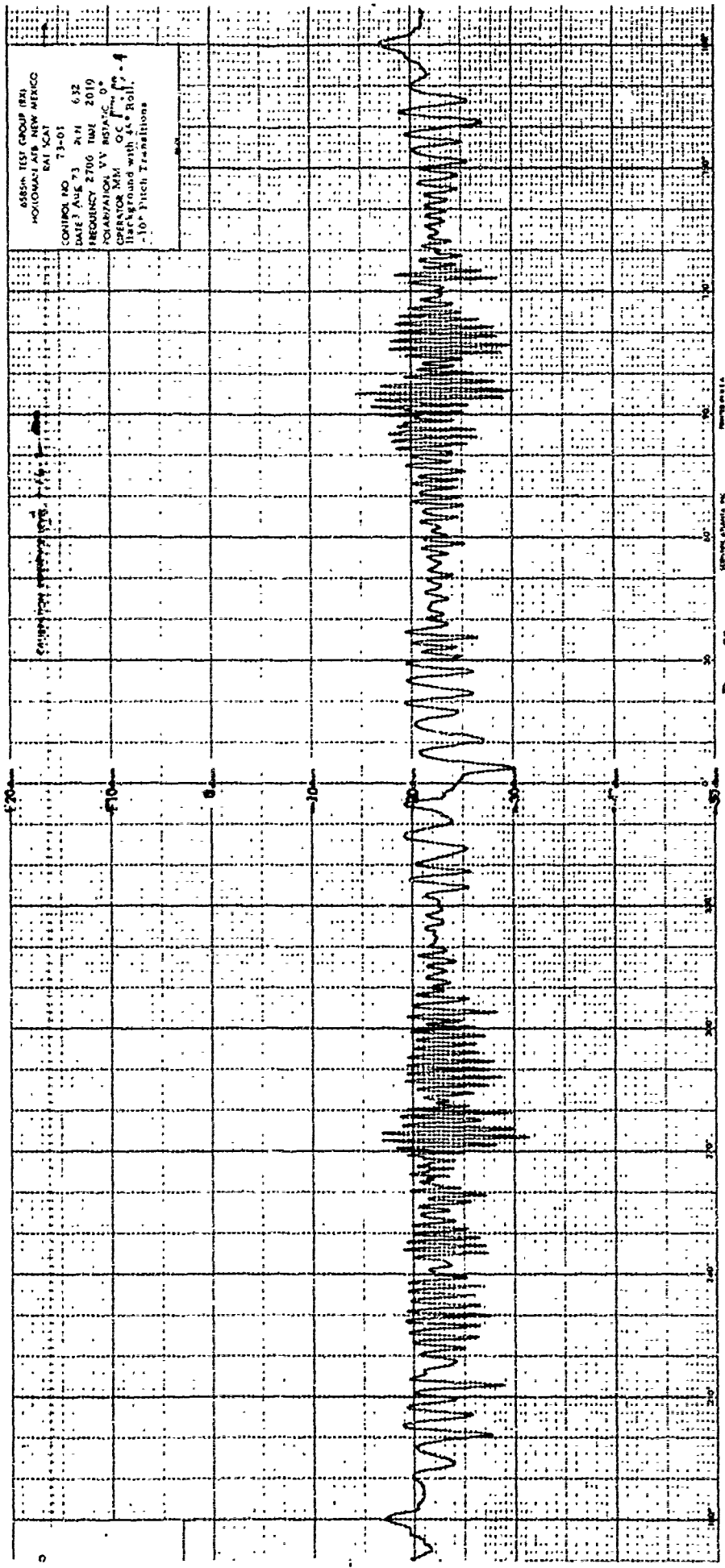




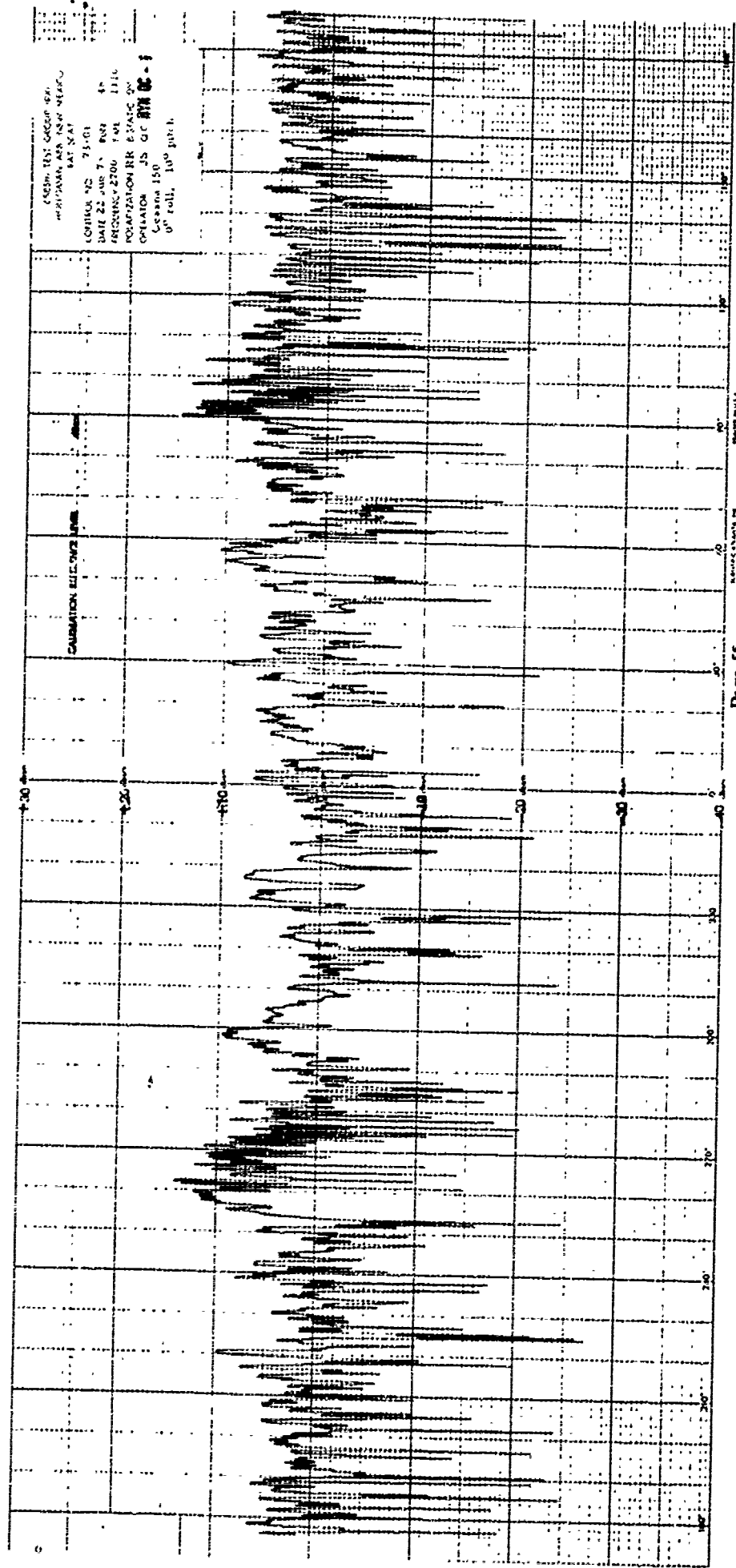




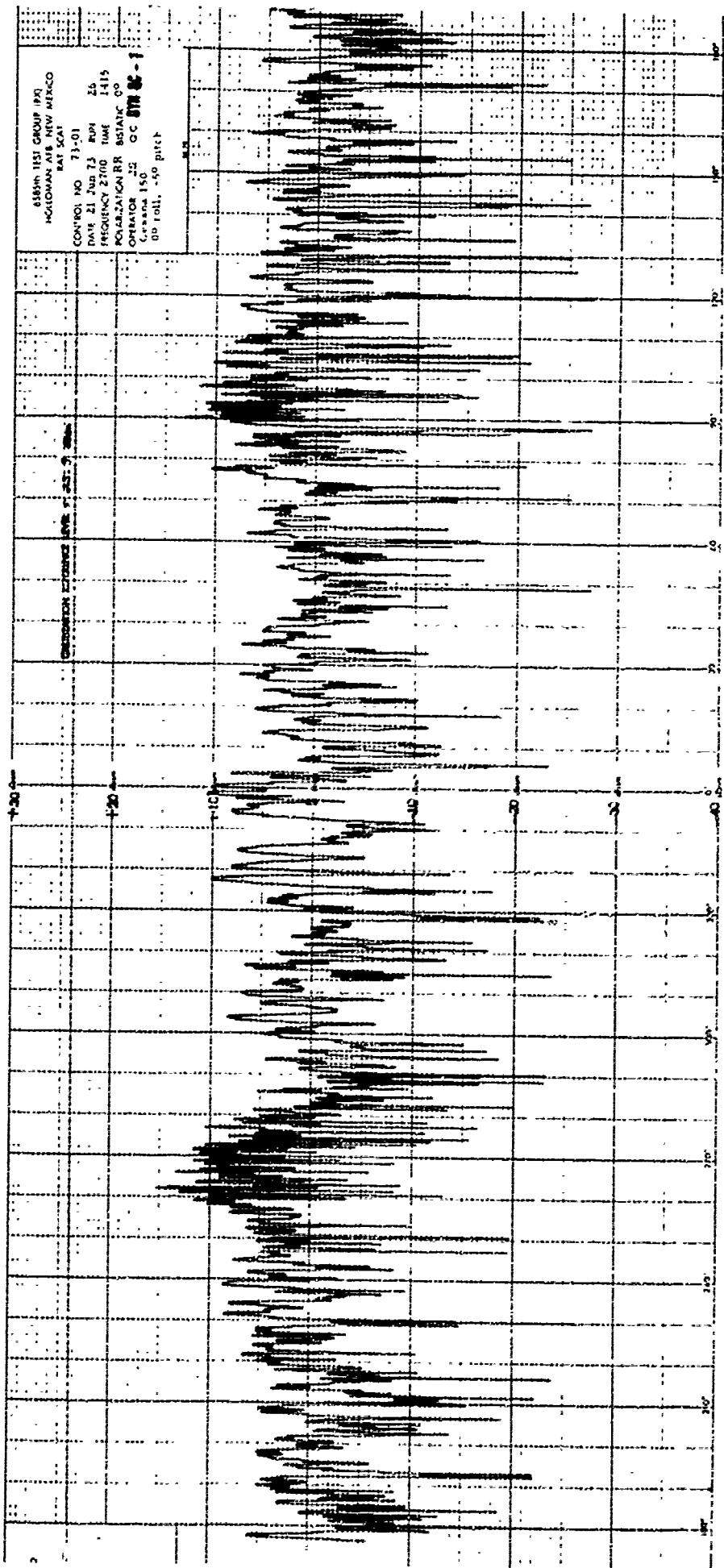






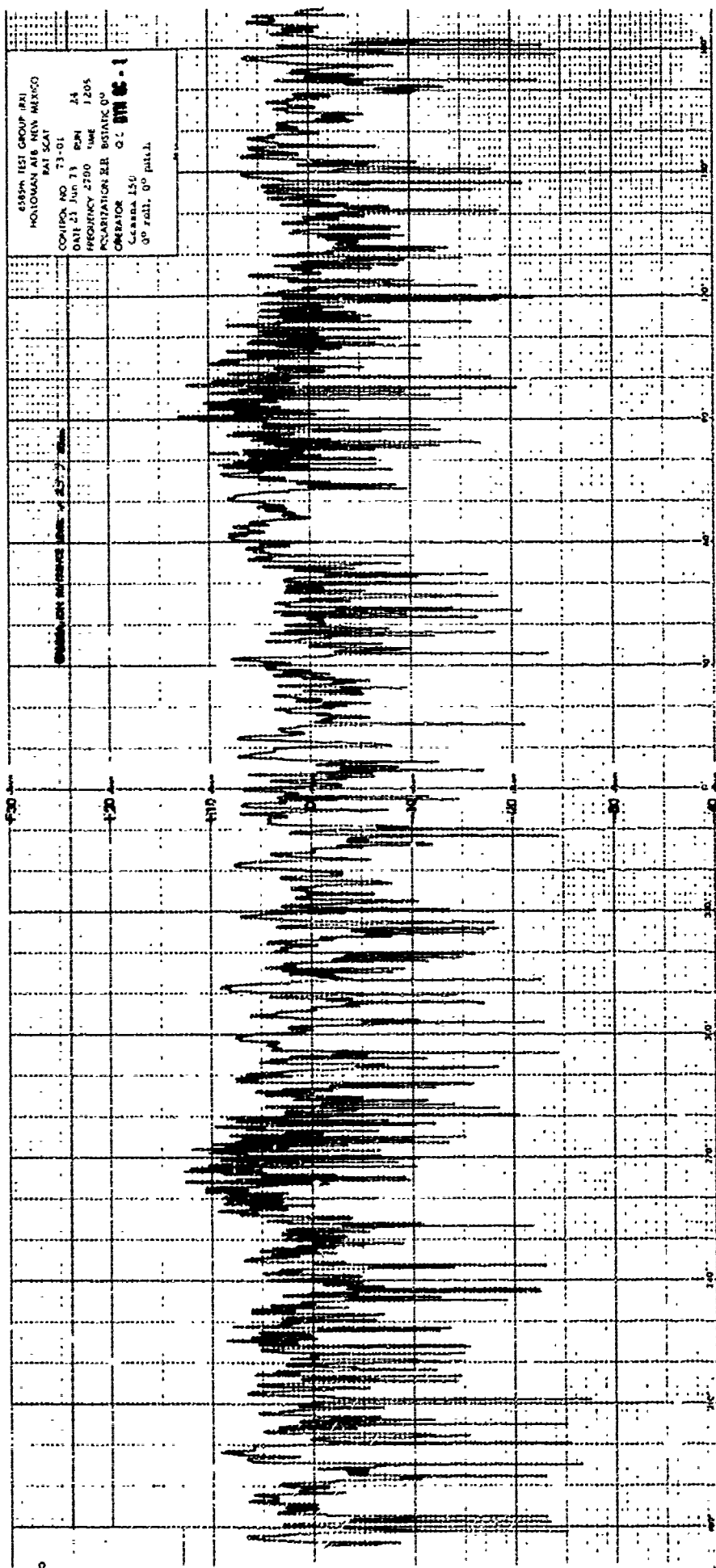


4000m TEST GECOP 561  
 1000m TEST GECOP 561  
 CONTRACT NO. 73-01  
 DATE 22 June 73 R02 4"  
 FREQUENCY 2700 100 1110  
 POLARIZATION RR 65/150 00  
 OPERATOR JS GC 878 00-1  
 Cassini 150  
 0° roll, 10° pitch

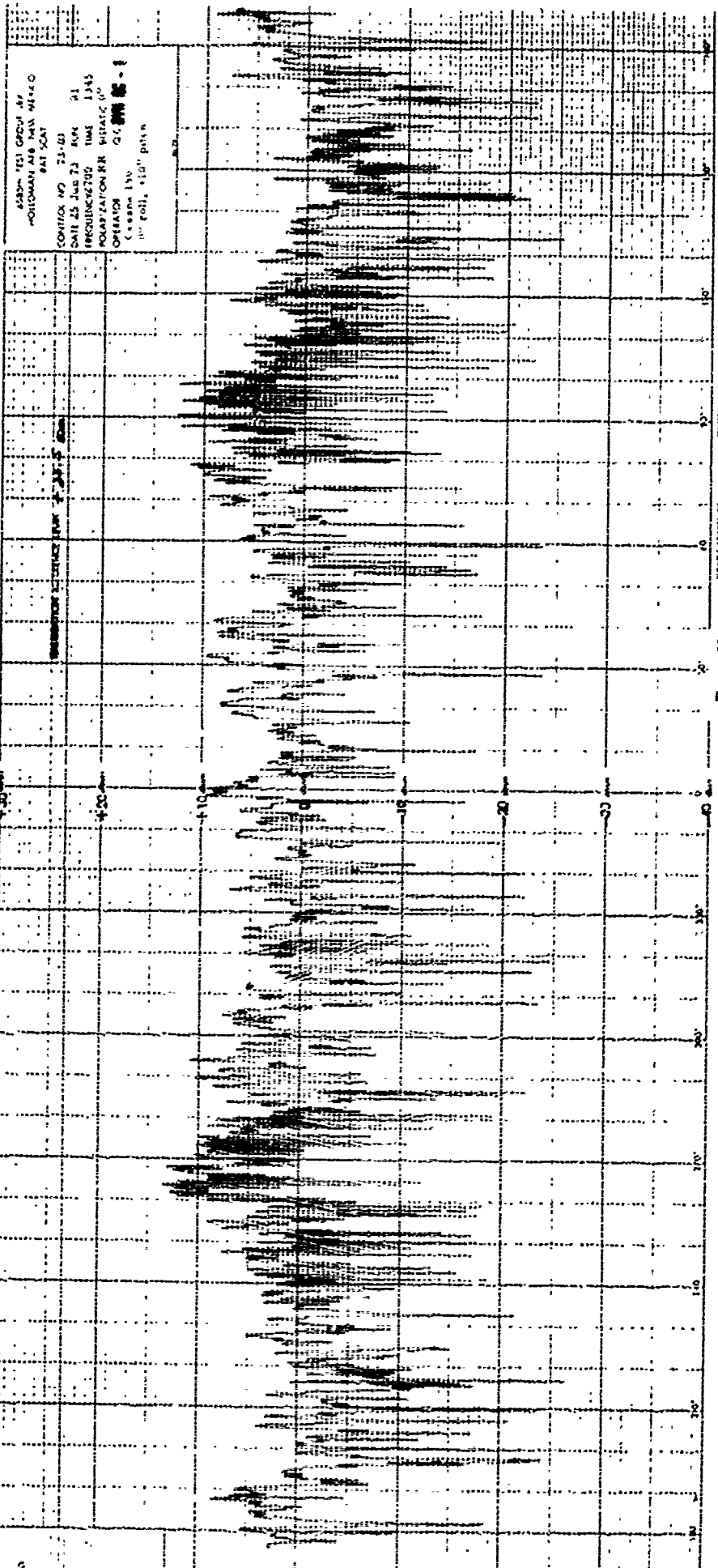


6350H TEST GROUP (PQ)  
HOLLOWAY AFB NEW MEXICO  
BAT SCAT  
CONTROL NO 73-01  
DATE 21 Jun 73 RPT ZA  
FREQUENCY 2700 HME 1415  
POLARIZATION RR BRANC CO  
OPERATOR 150 CC 8TH SC-7  
00 full, -50 pitch

CROSS SECTION LINES







6239-121 GDSJ 47  
HOLCOMB AIR TBN W-140  
BAT SCAT  
CONTROL NO 73-03  
DATE 25 Jun 73 RCM 01  
FREQUENCY 7200 HZ  
ACQUISITION RR 1345  
OPERATOR G. C. B. 05-1  
Cassette 130  
100' coil, 110" gain

ASST. TEST GROUP (2)  
HOLCOMB AFB, NEW MEXICO

DATE 20 Jun 73

CONTROL NO 73-01

TIME 1116

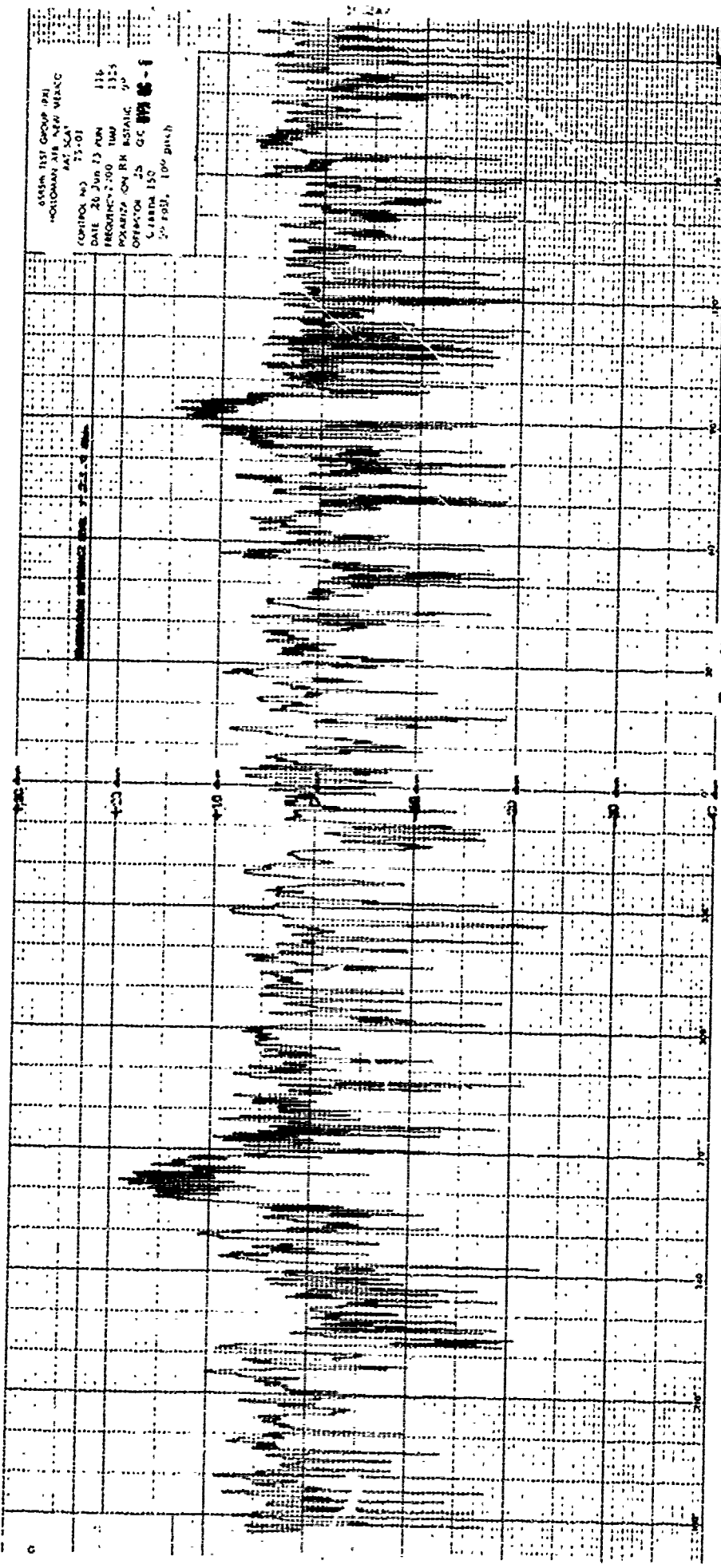
FREQUENCY 200 MHz

POSITION ON RN 1325

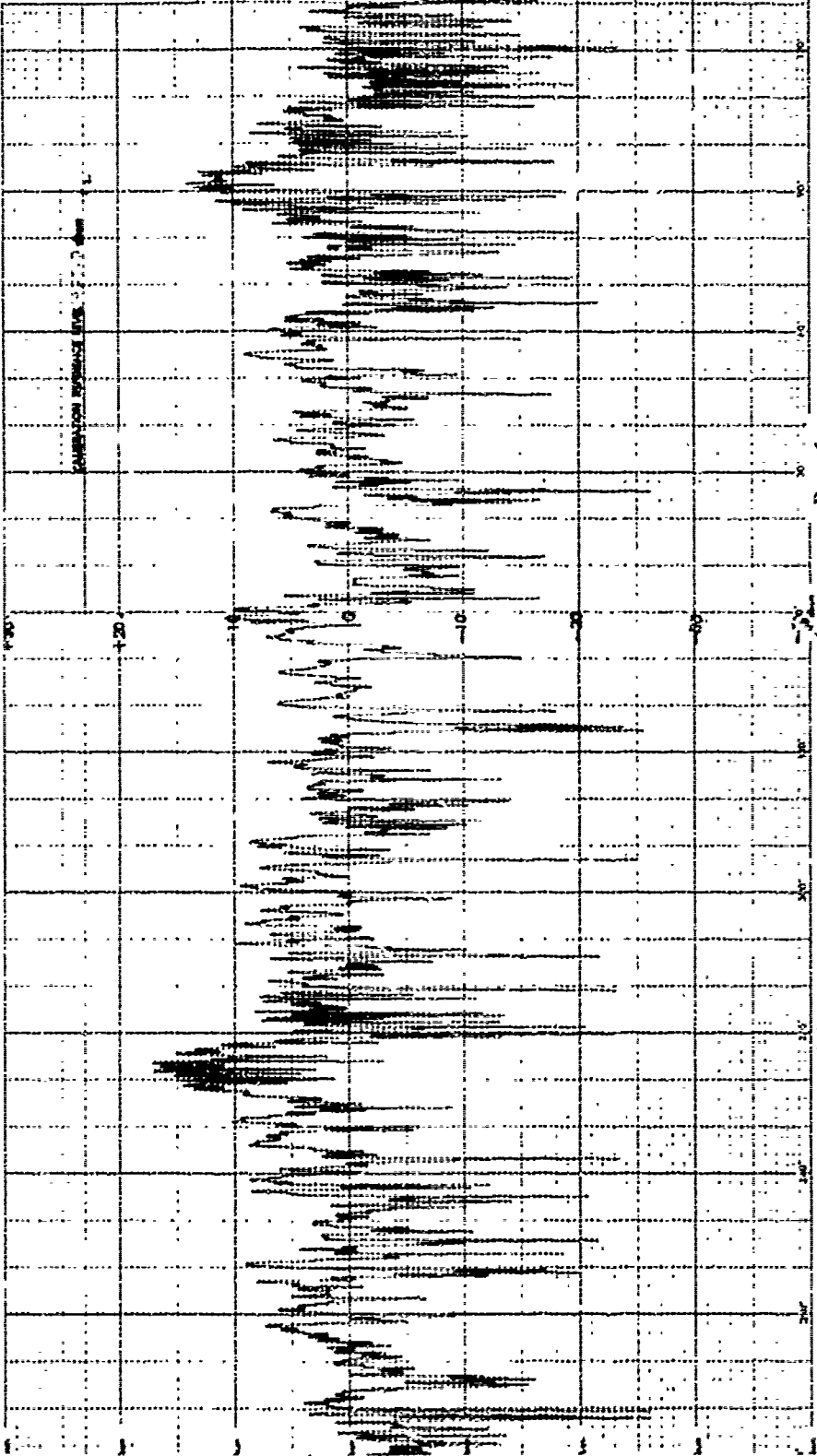
OPERATOR JS GC 889 88-8

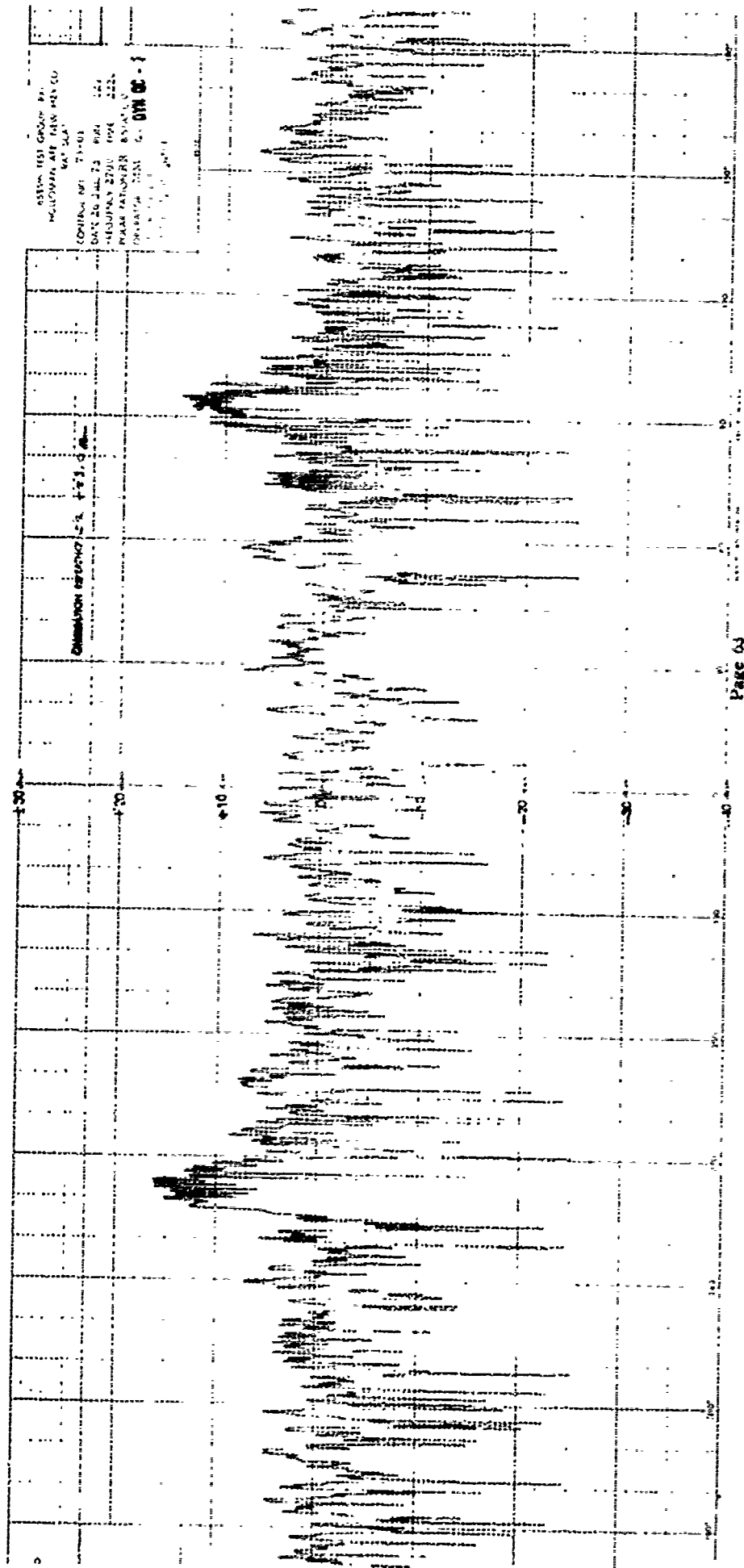
CARRIER 150

200 FSB, 100 dB



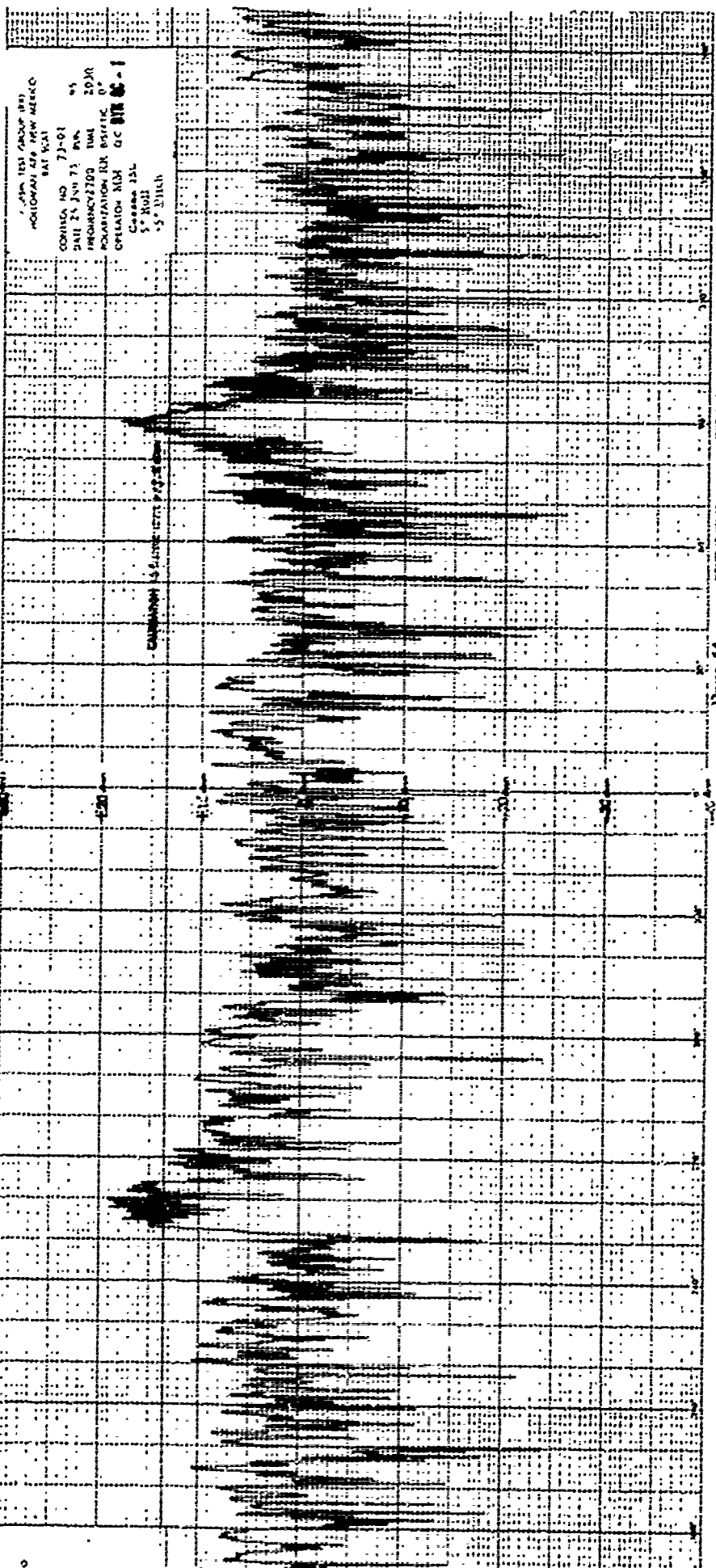
6554 112' GROUP III  
HOLIFORD AIA NEW MEXICO  
PAT SCAT  
CONTRIN NO 73-01  
DATE 26 Jun 73 RUN 123  
FREQUENCY 2700 TIME 1110  
PHASE/AVG/IN/OUT/STALK/00  
OPERATOR JS OC 1-10-1  
C-7-10-150  
40 roll, 40 pitch



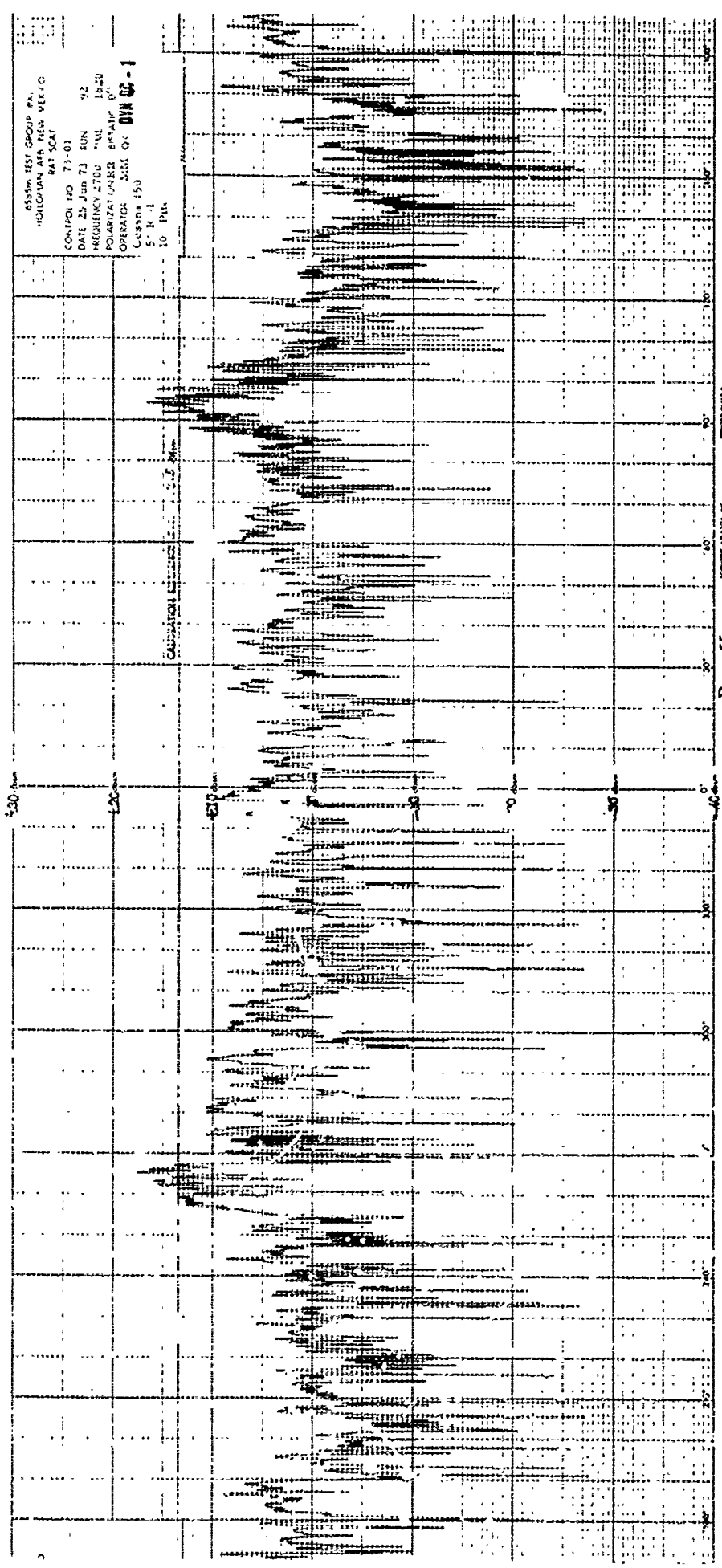


ASTON TEST GROUP, INC.  
HOLLOMAN AIR BASE, NEW MEX  
CONTRACT NO. 71-001  
DATE 20 JUL 73 BY 124  
REVISION 2700 1994 222  
PARAMETER 8547.0  
INSTRUMENT 1247.0  
ON 06 - 1



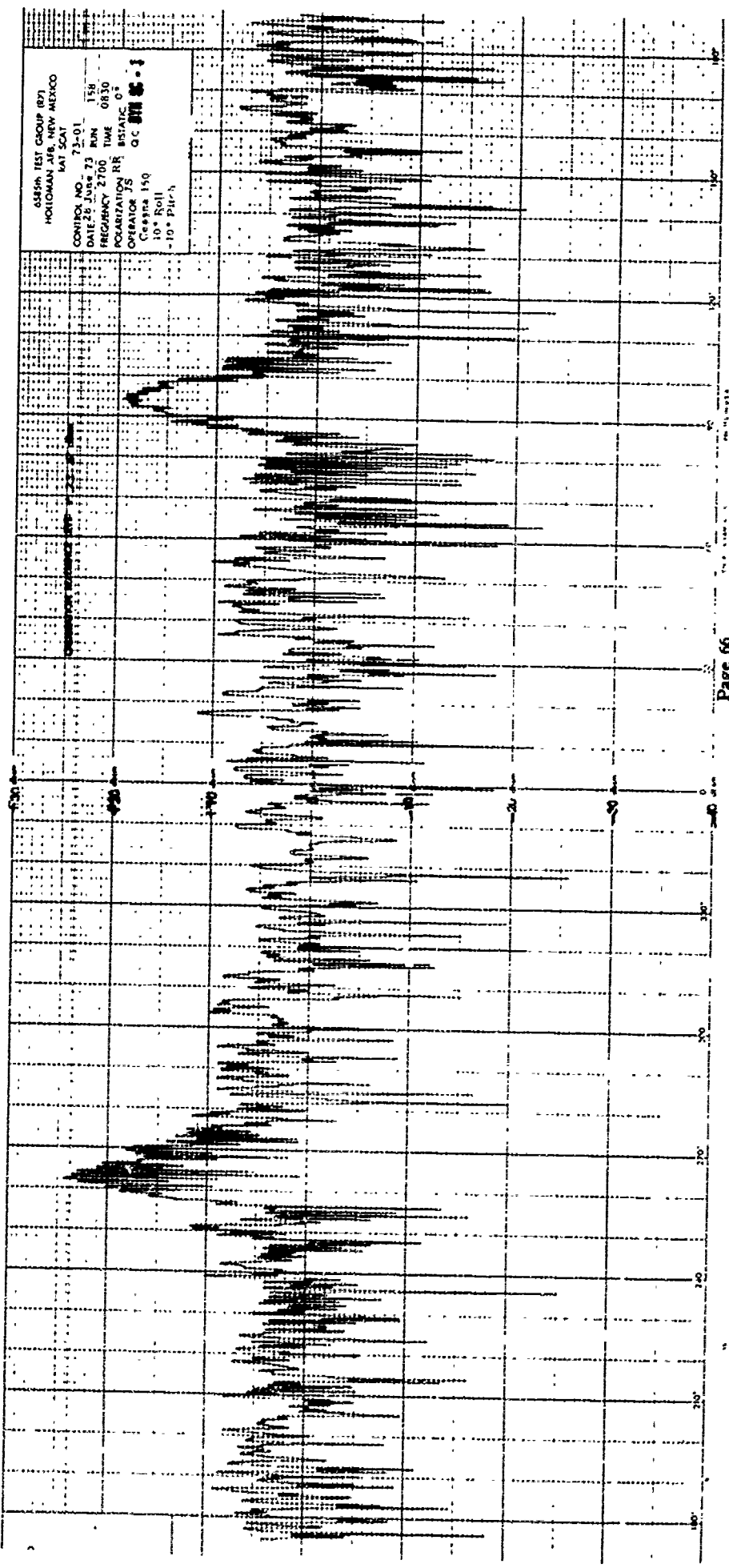


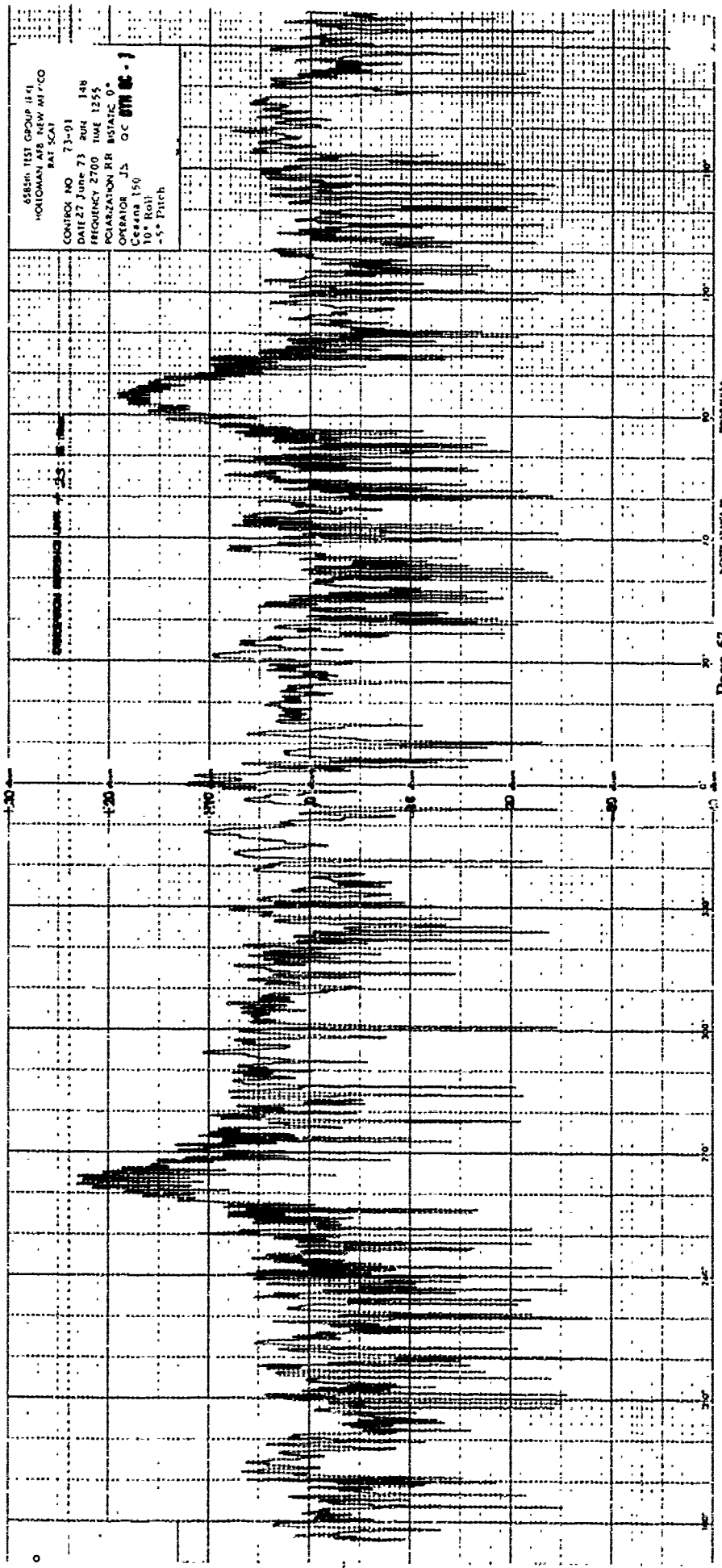
1. 400 1000 (GROUP 10)  
POLYGRAPH 1000 NEW MEXICO  
DATE 10/1  
CONTRACT NO 73-01  
DATE 25 JUN 73 BYN  
INFORMATION FOR BUREAU  
OPERATION NIM QIC BITE 00-1  
Case 100  
5" Roll  
15" Width

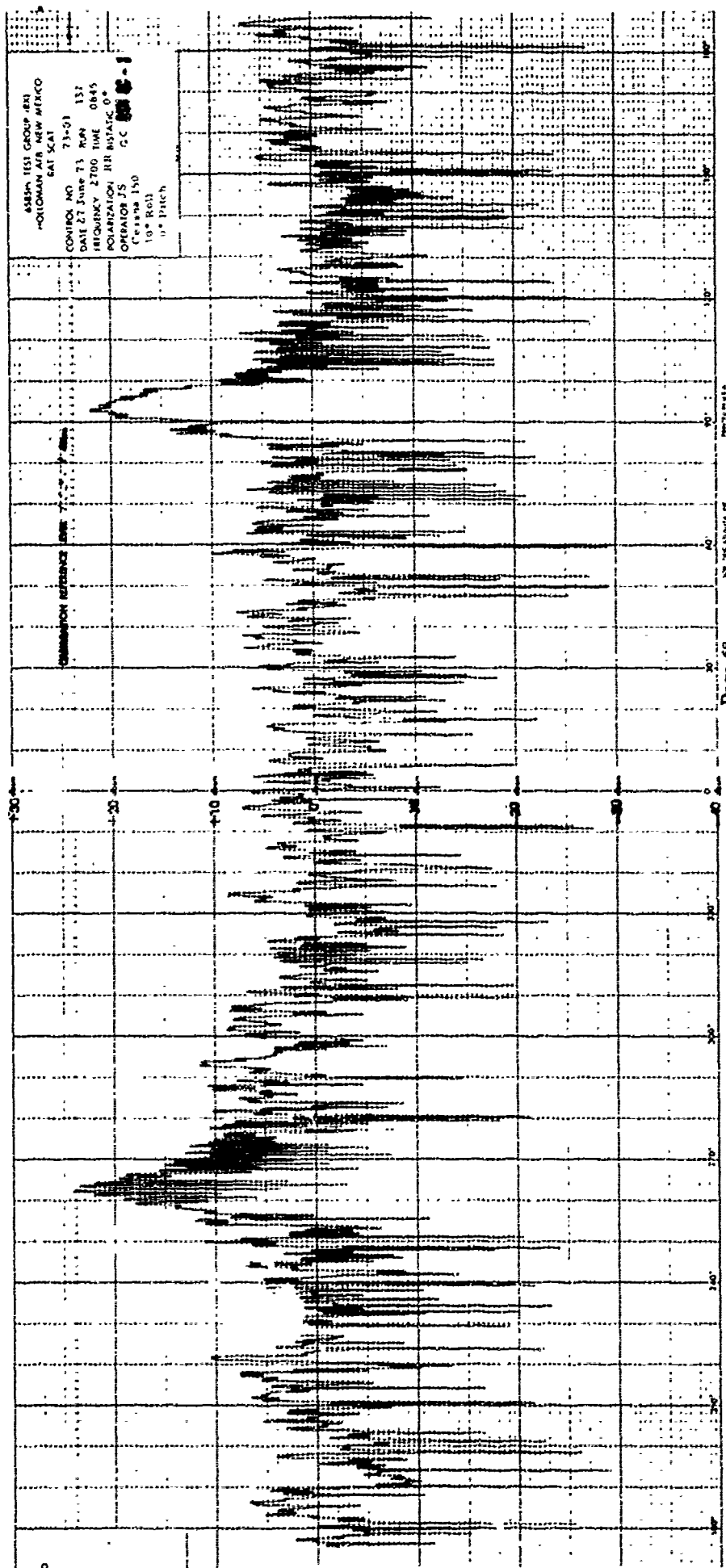


6550m TEST GROUP RA.  
HOLCOMB AFB NEW MEX CO  
RAT SCAT  
CONTROL NO. 71-01  
DATE 25 Jun 73 SUN 42  
FREQUENCY 2700 MHz 1500  
POLARIZATION VERT BRVAT 0  
OPERATOR SSS Q: 01A Q-1  
Losses 150  
5" R 4  
10 Pts

6545H TEST GROUP 071  
HOLLOMAN AFB, NEW MEXICO  
LAT 34° 01'  
CONTR NO. 73-01  
DATE 28 JUN 73 RUN 154  
FREQUENCY 2700 TIME 0830  
REGISTRATION RE BSTATIC 0°  
OPERATOR JS  
Cessna 150  
10° Roll  
-10° Pitch







ASIAN TEST GROUP (RT)  
HOLLAND AIR NEW MEXICO

CONTROL NO 73-01

DATE 29 June 73 RWL 183

FREQUENCY 2700 TML 0915

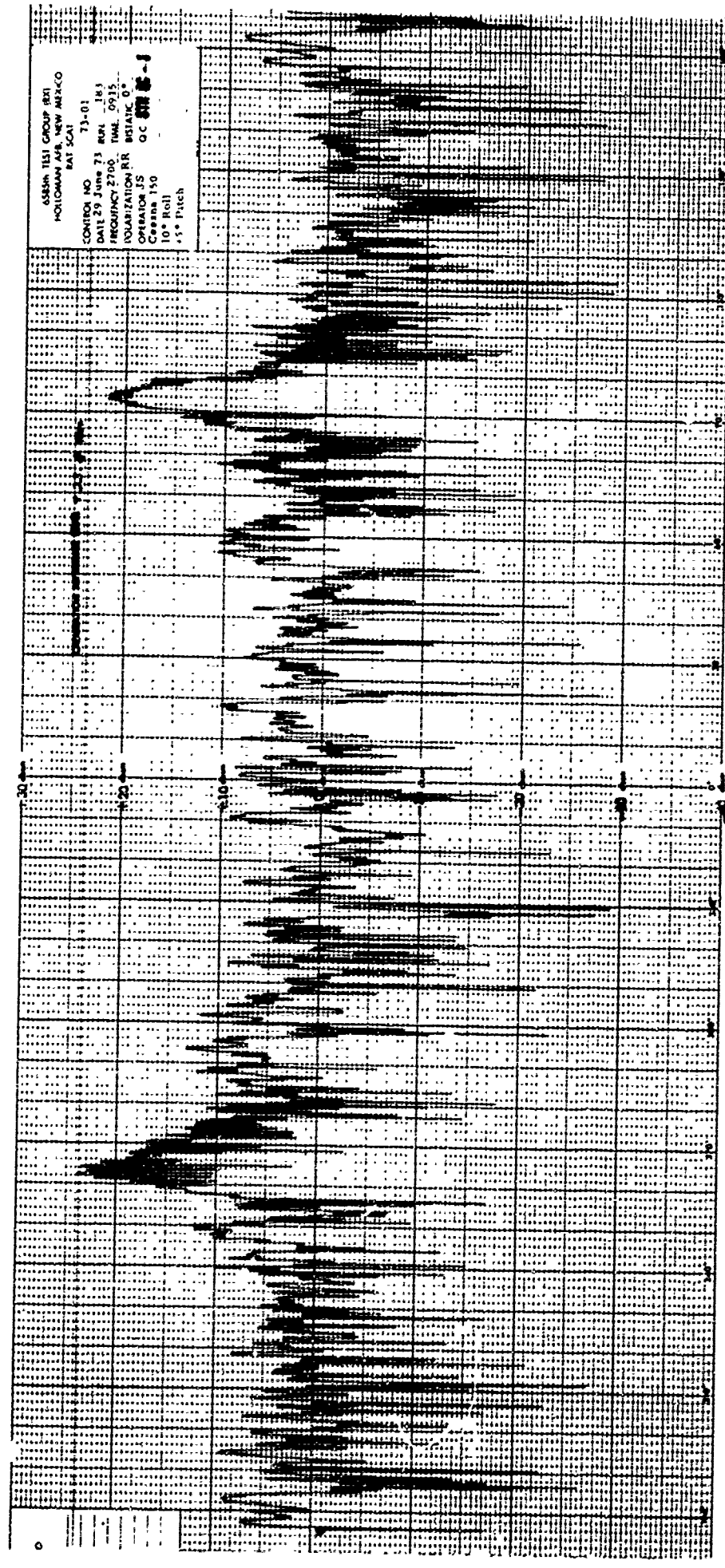
POLARIZATION RR BRITAC 0°

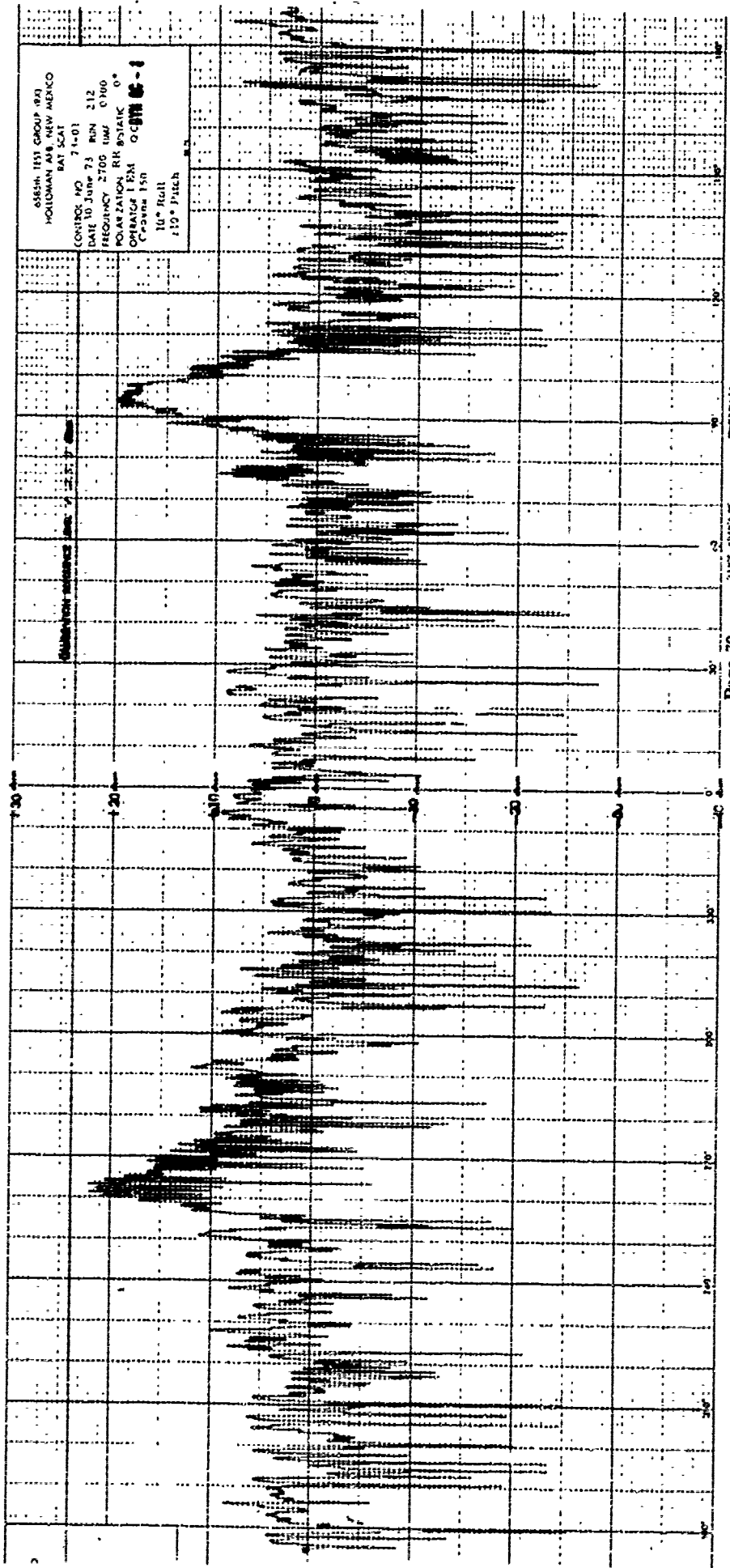
OPERATOR JS

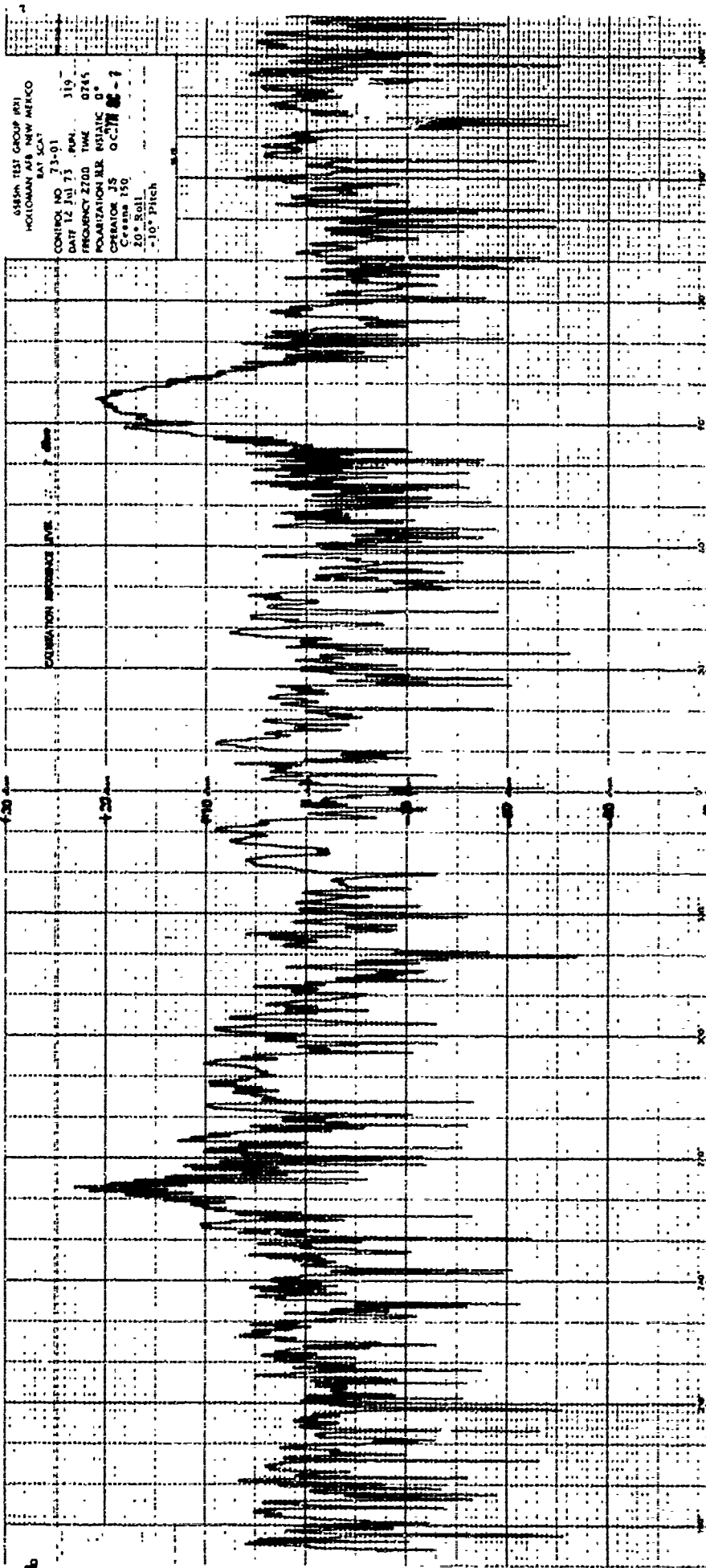
Cassina 150

10° Roll

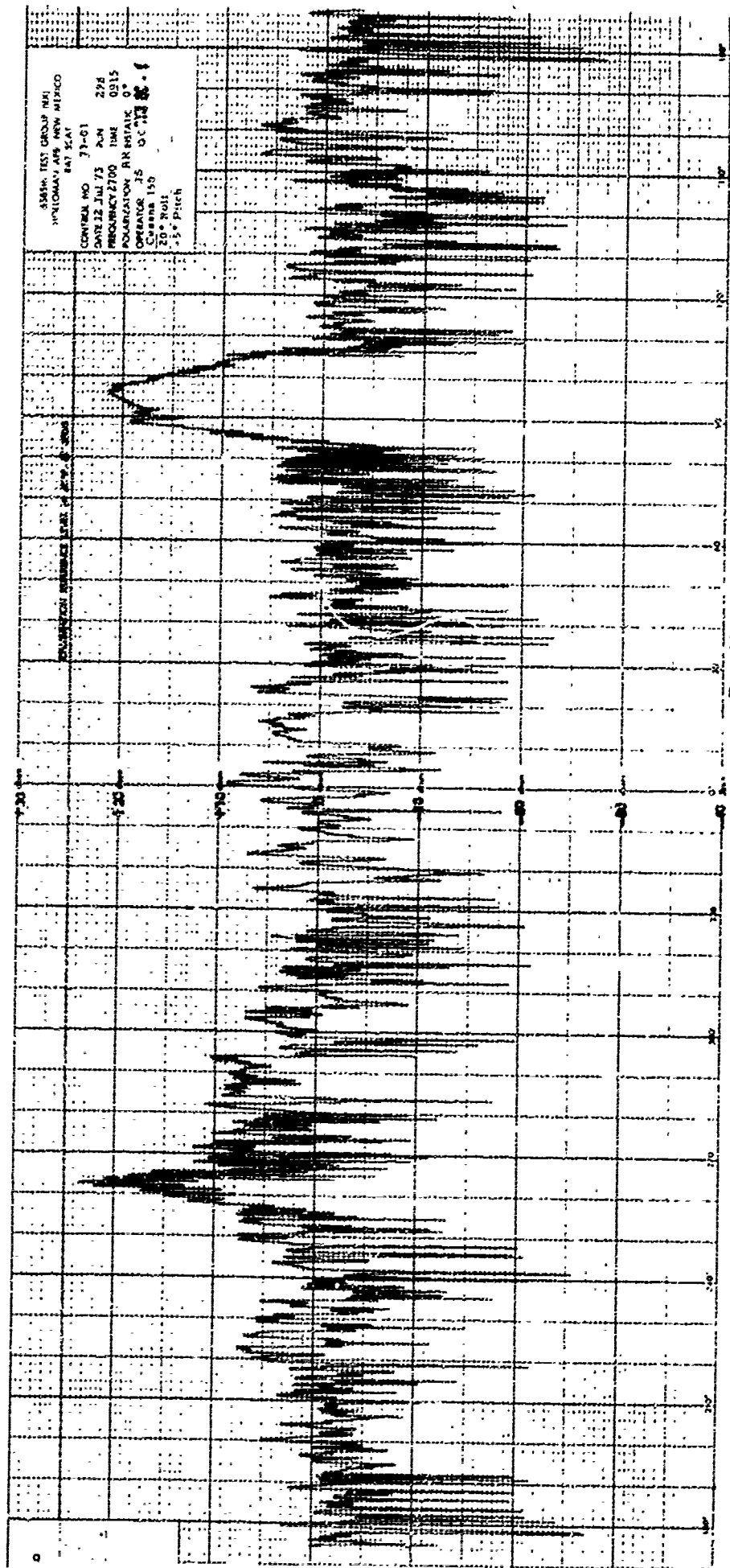
45° Pitch







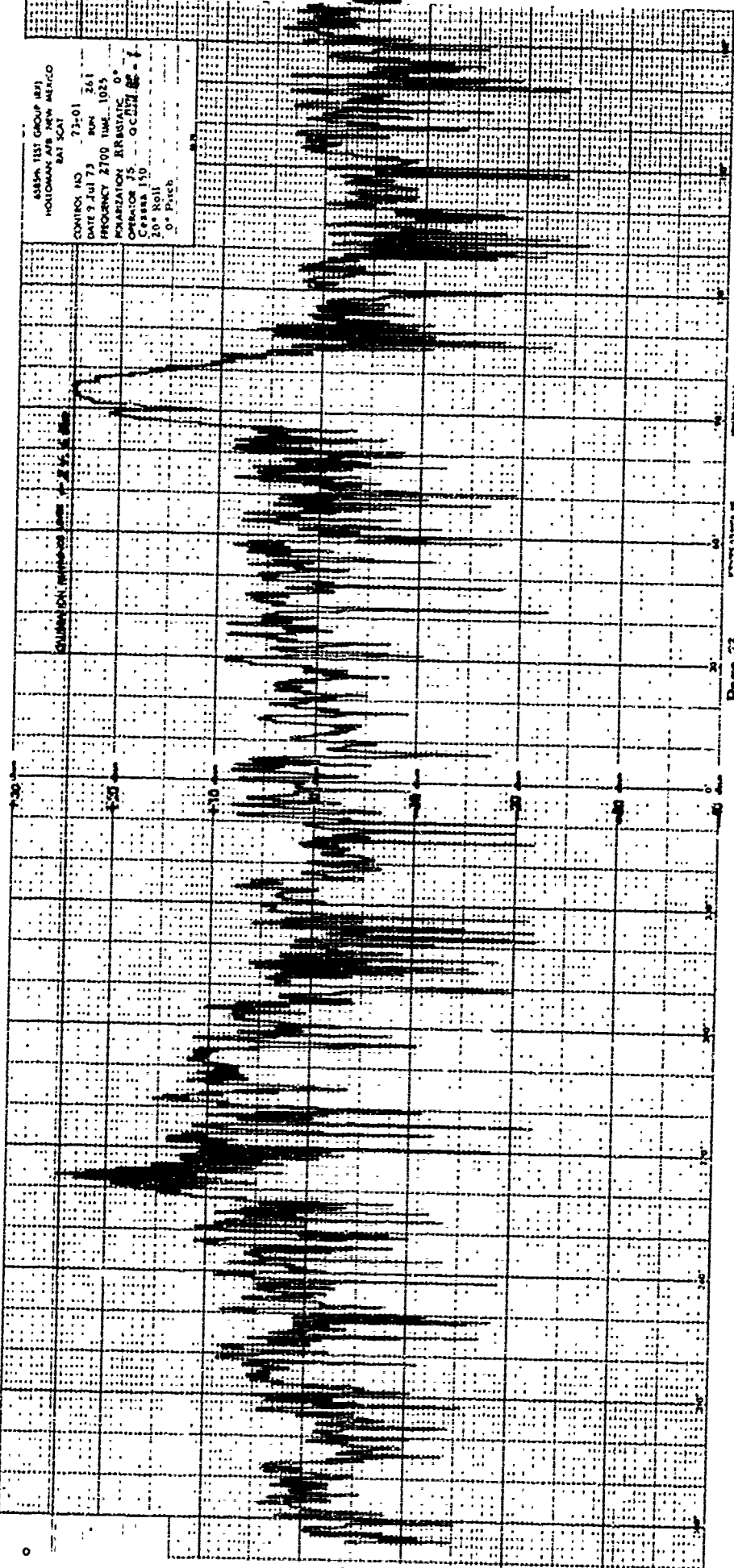


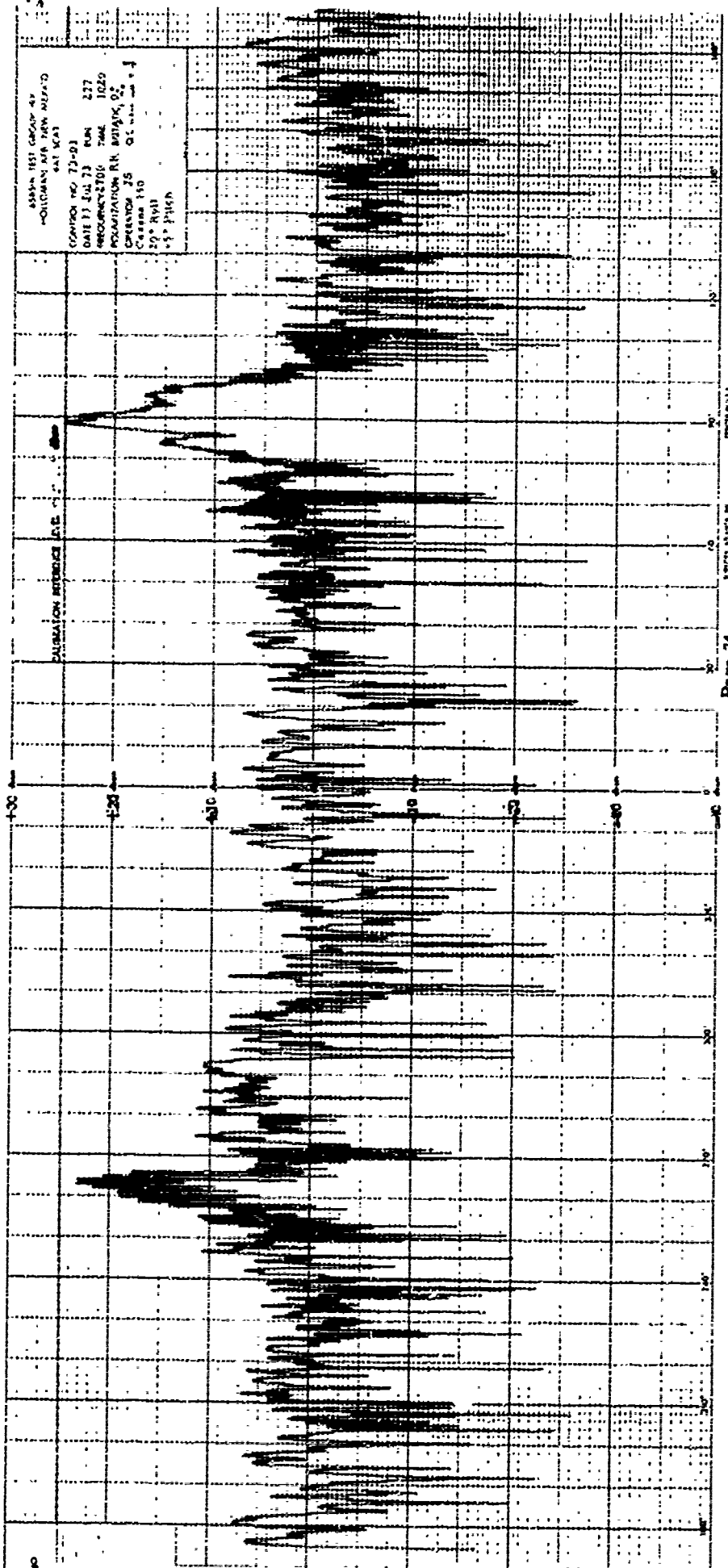


6350A TEST GROUP (RT)  
HOLCOMB, NEW MEXICO  
BAT SCAT

CONTROL NO 71-01  
DATE 9 Jul 73 RUN 261  
FREQUENCY 2700 TUNE 1025  
POLARIZATION ERASE/STATE 0°  
OPERATOR JS - OCT 1973  
Cessna 150  
20° Roll  
0° Pitch

QUANTUM, measured from 1.25 to 1.50





ASSN. 1151 2500P PVI  
"CLOUAY" AIR 100N MEXCC  
M" SAT

CONTROL NO 11-01

DATE 11 Jul 73 PVI 20Y

FREQUENCY 2500 MHz 2806

POLARIZATION AIR-STATIC 0°

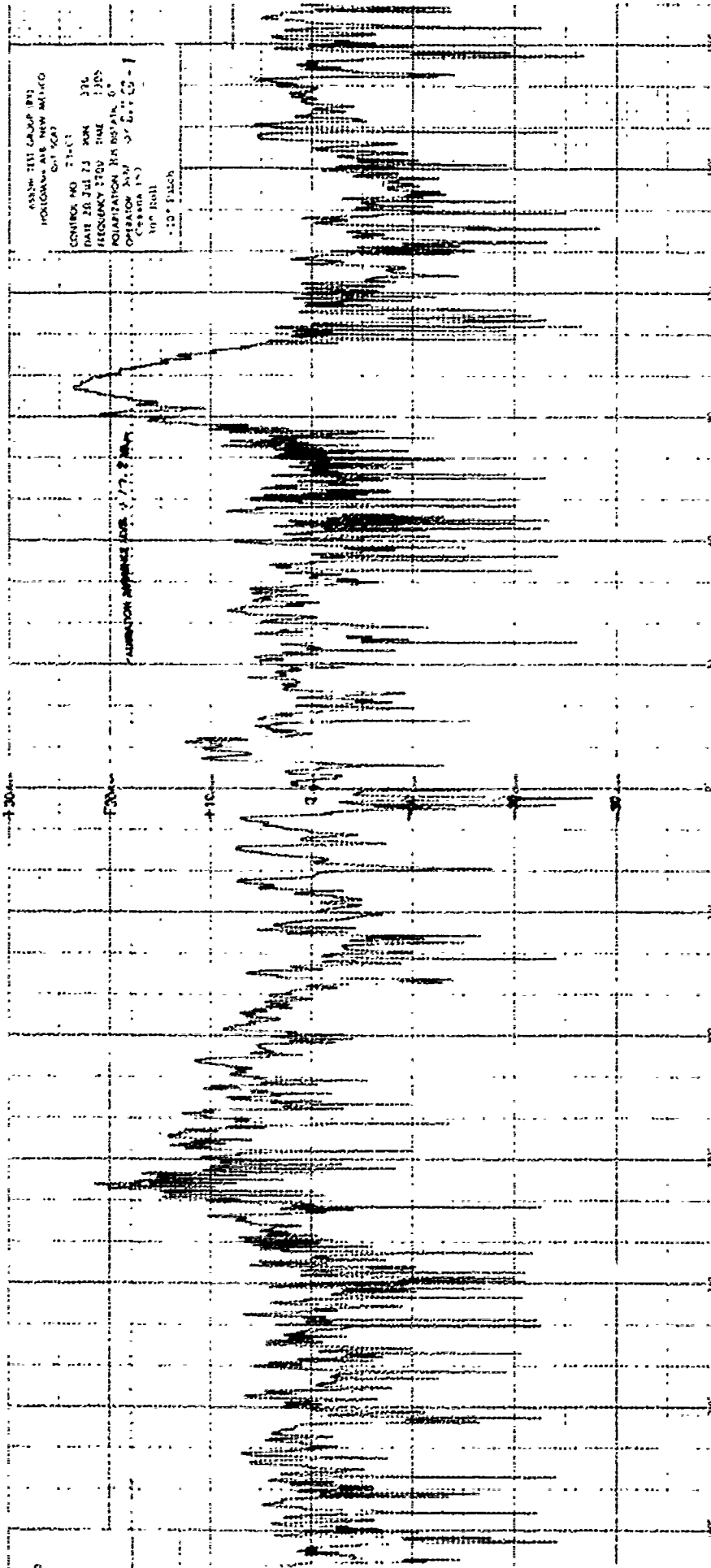
OPERATOR HK QCC 0706-1

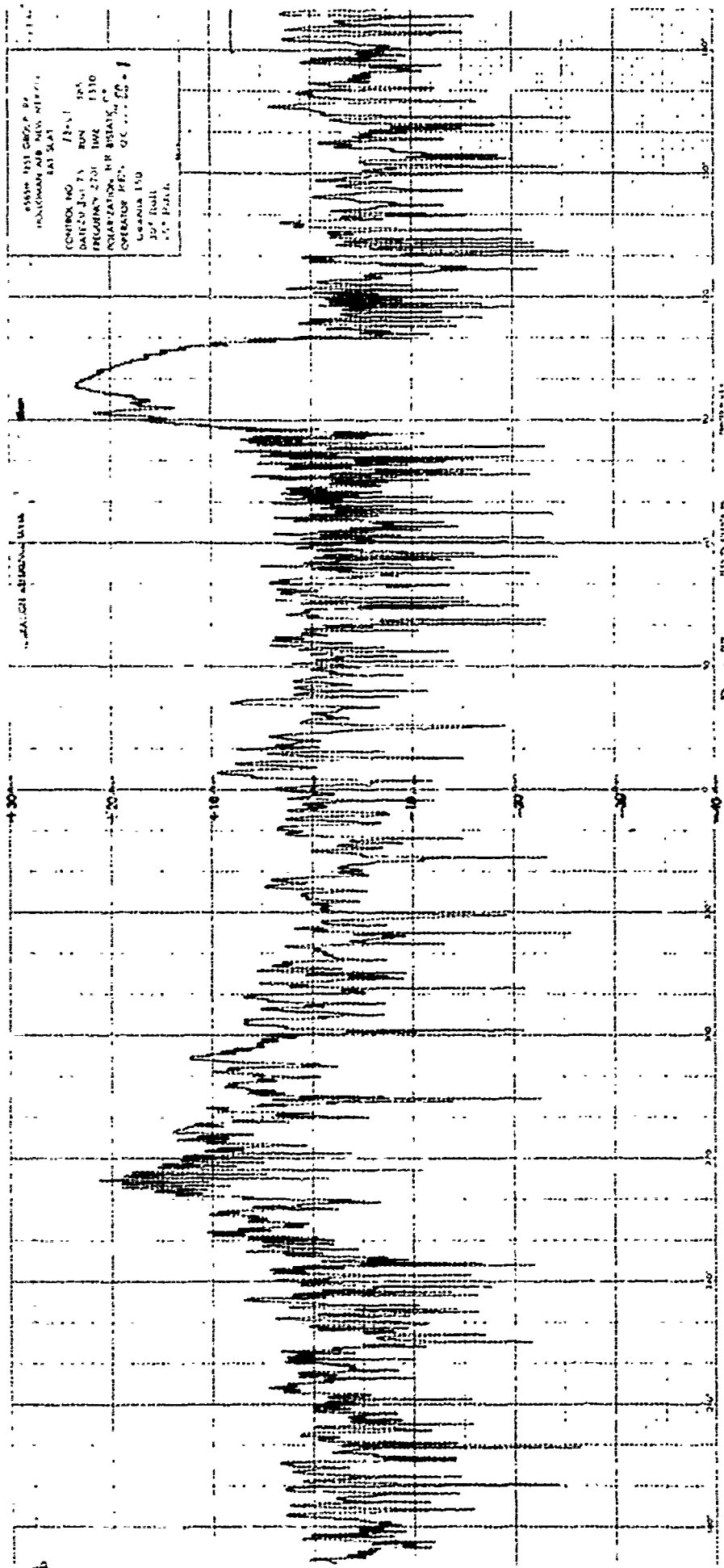
Greene (50

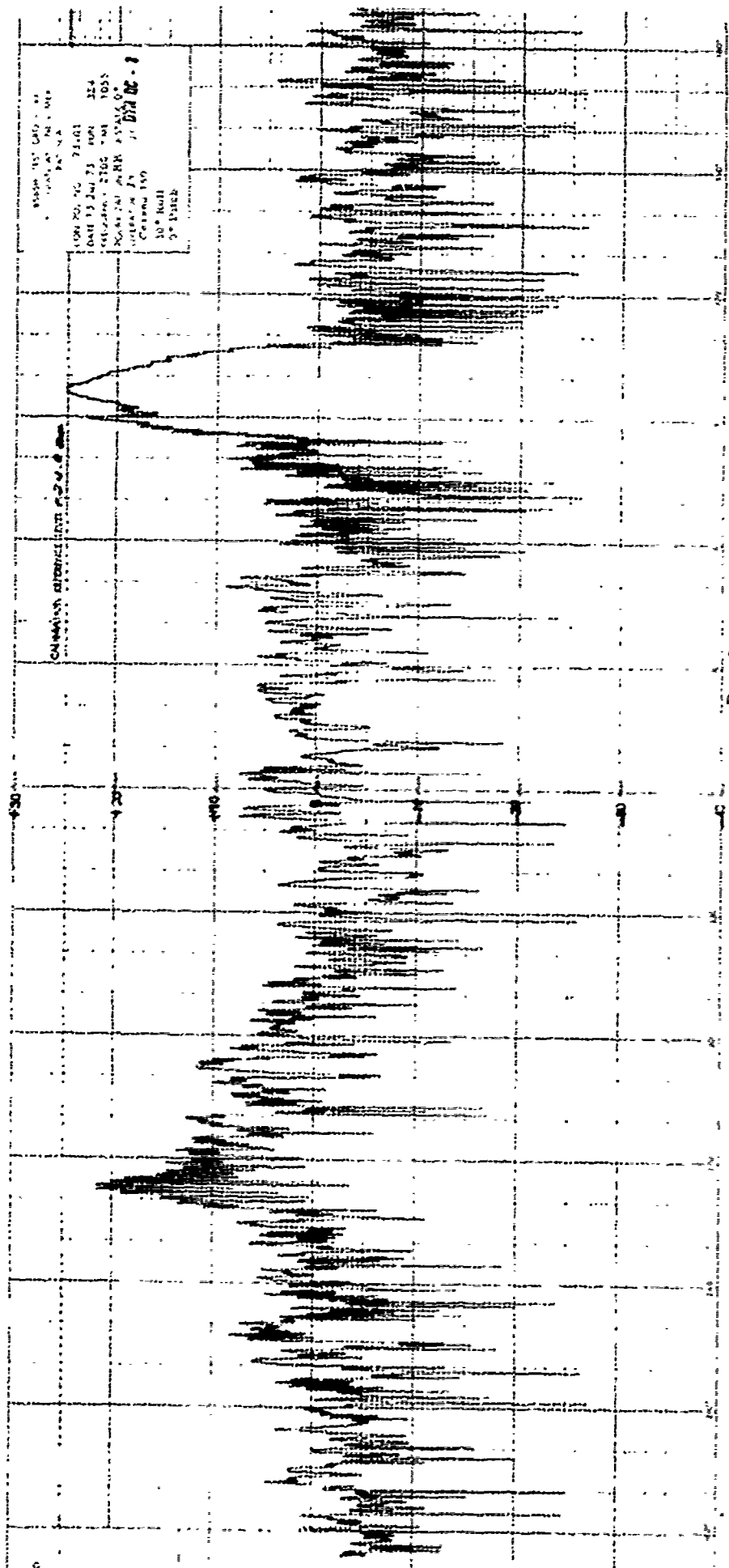
20° Roll

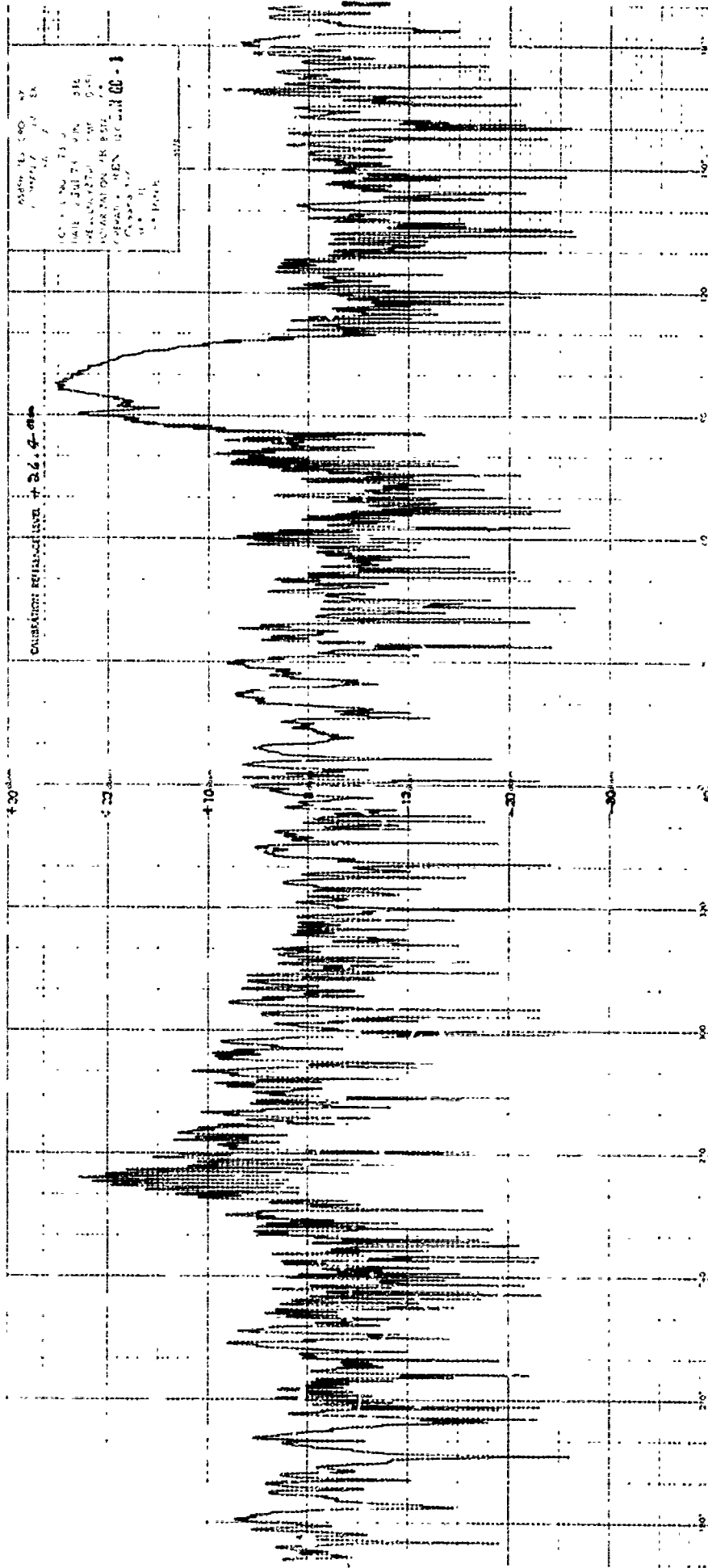
10° Pitch

ORBITATION 0706-1100-11-01-1-0000











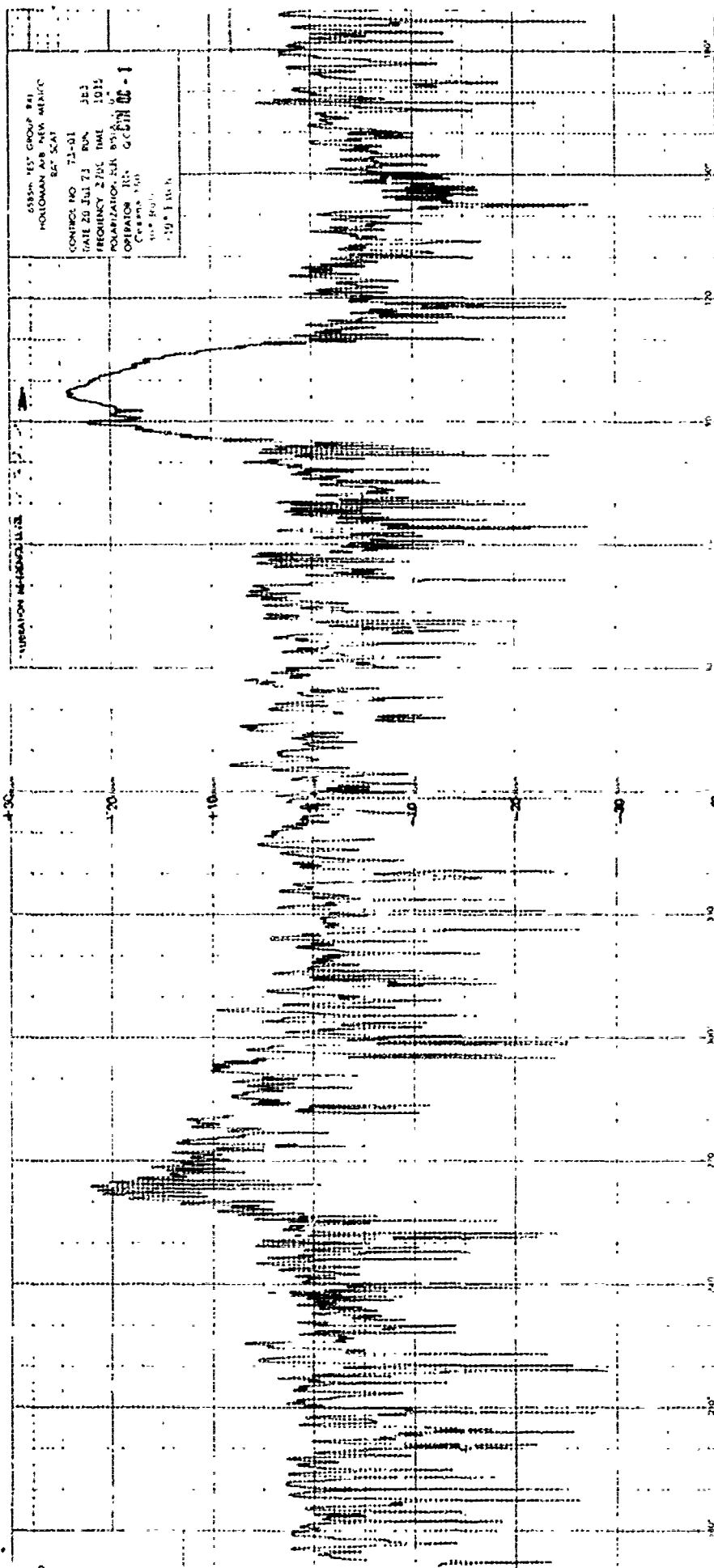
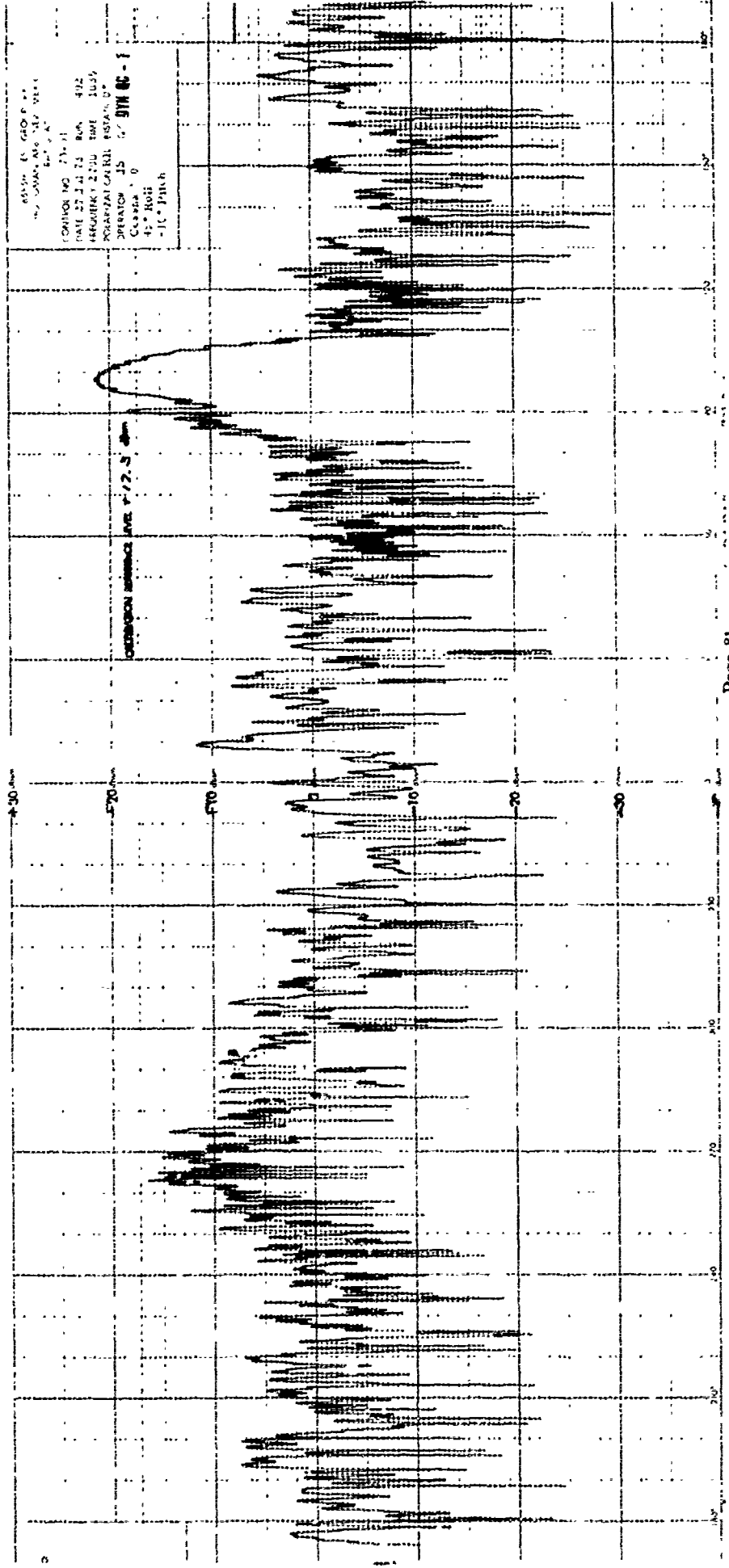
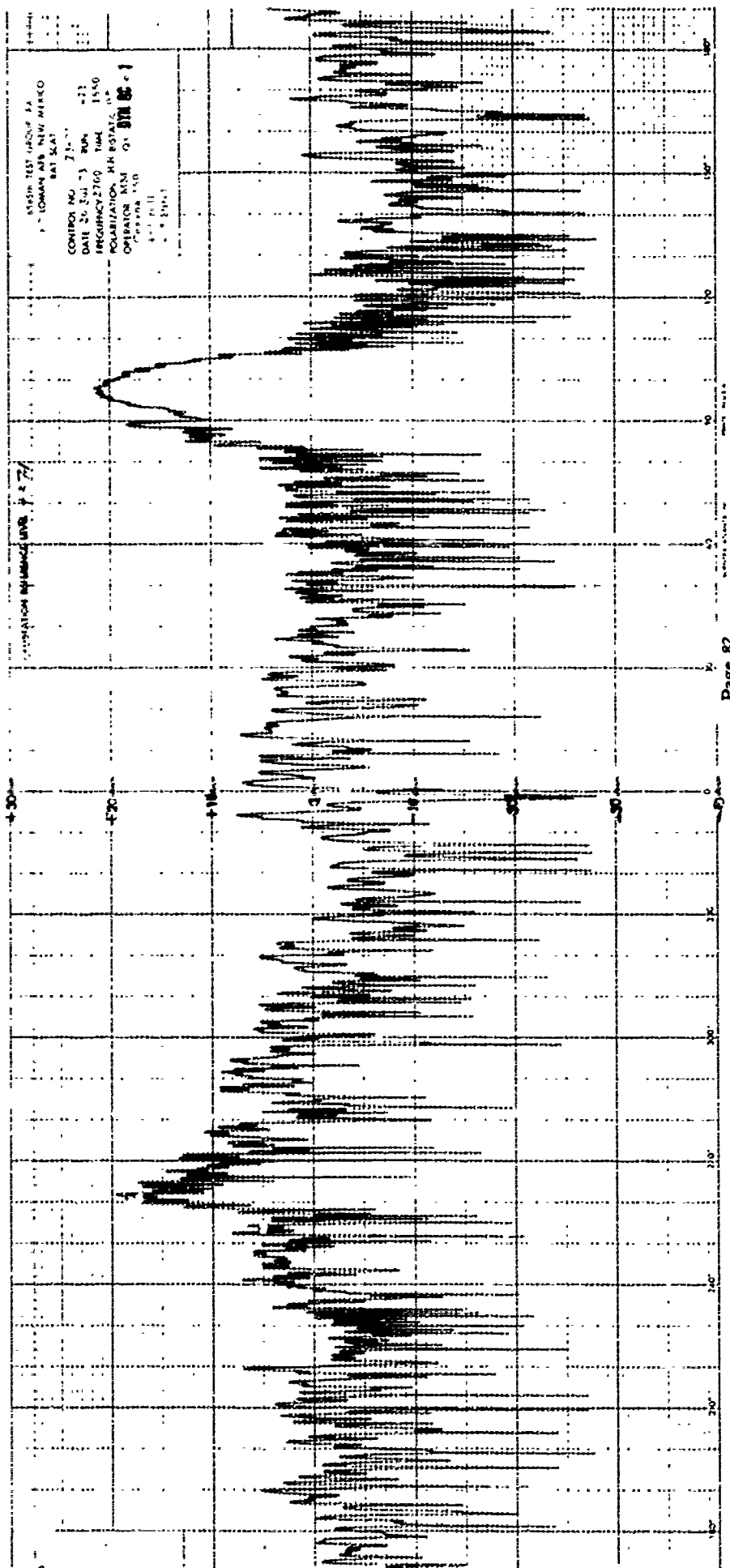
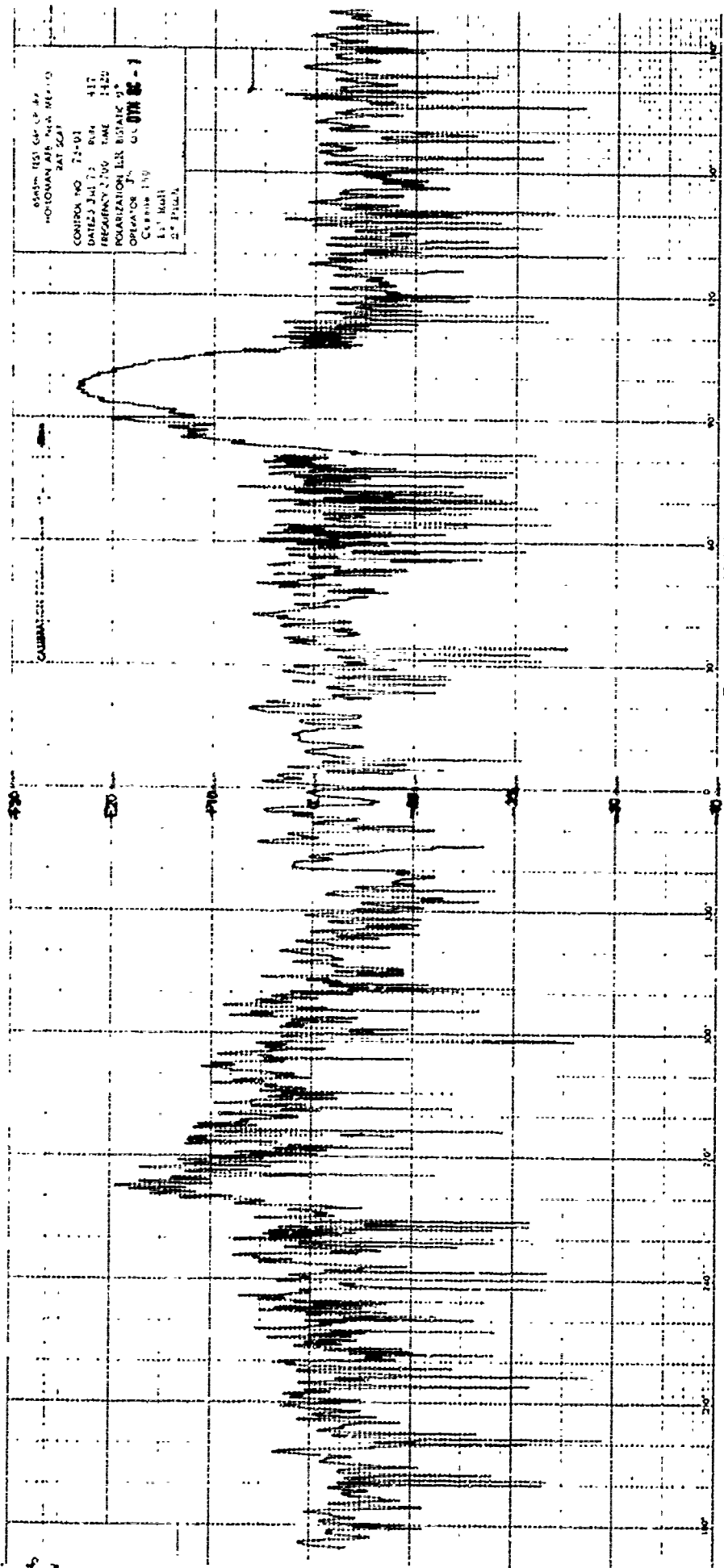
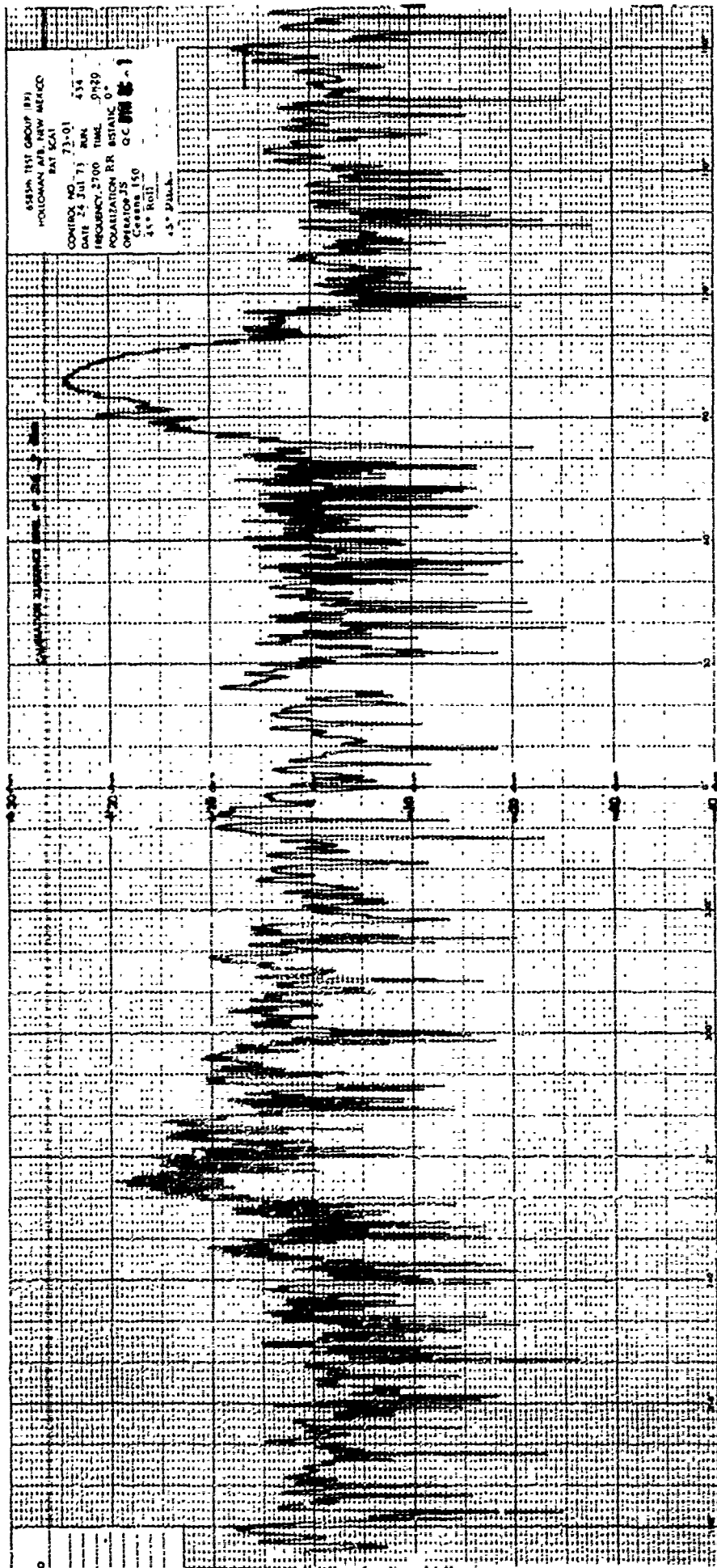


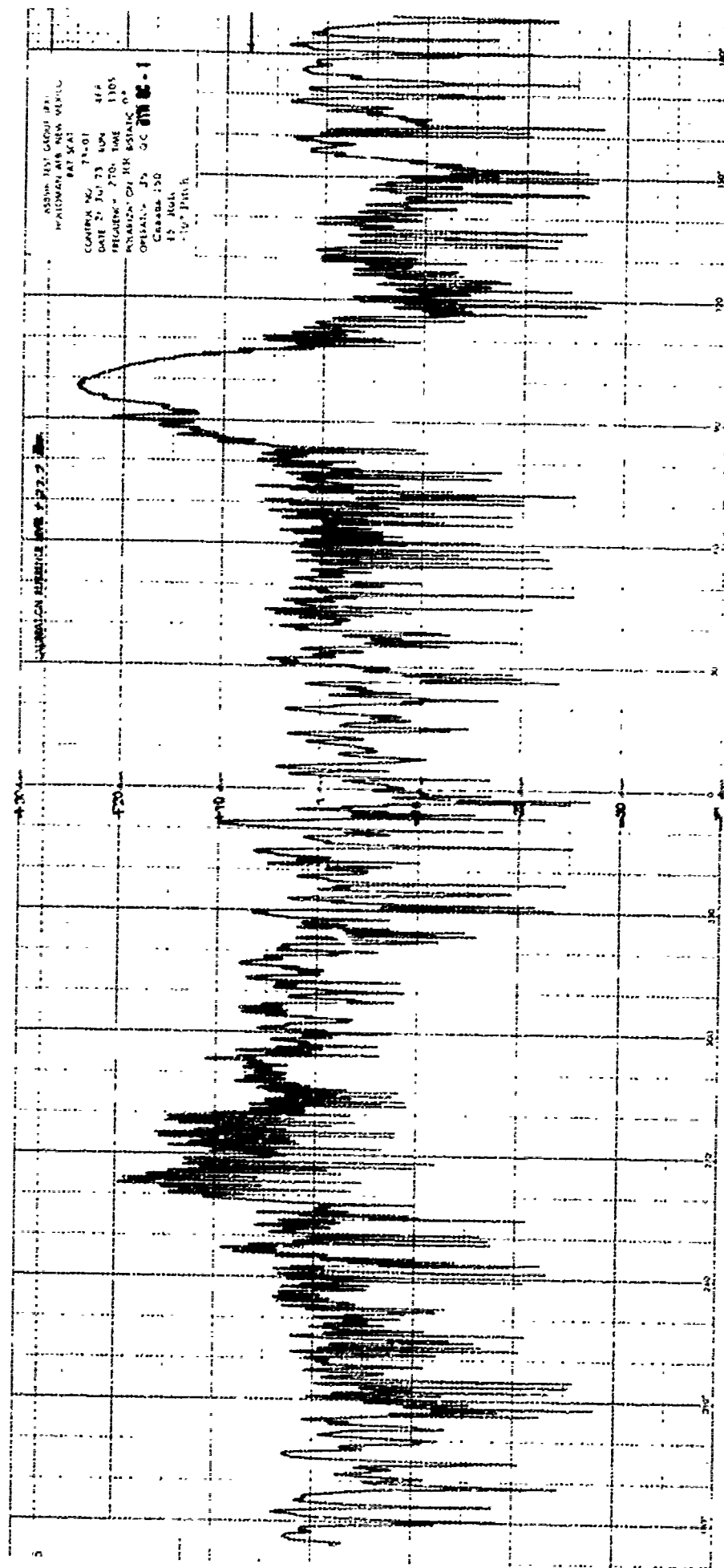
Figure 80

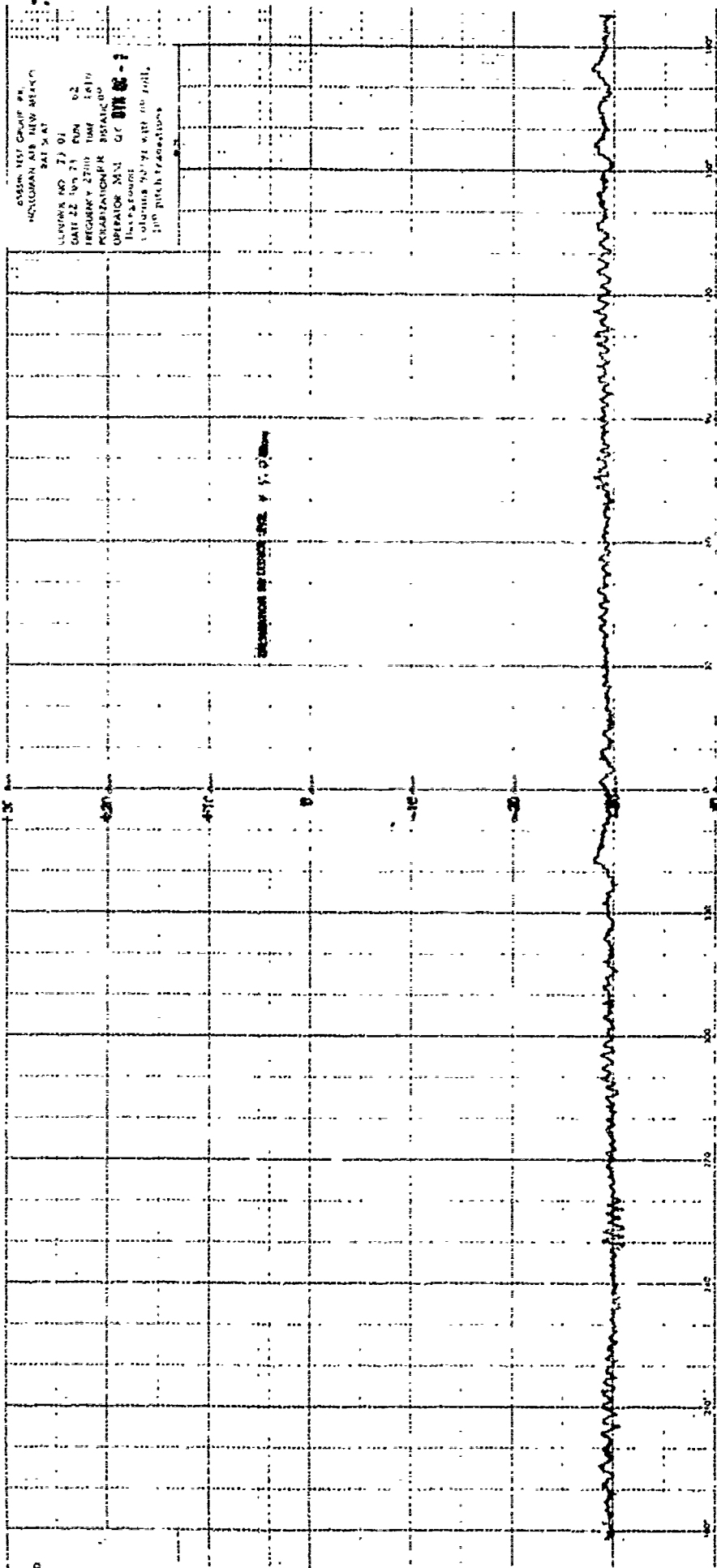








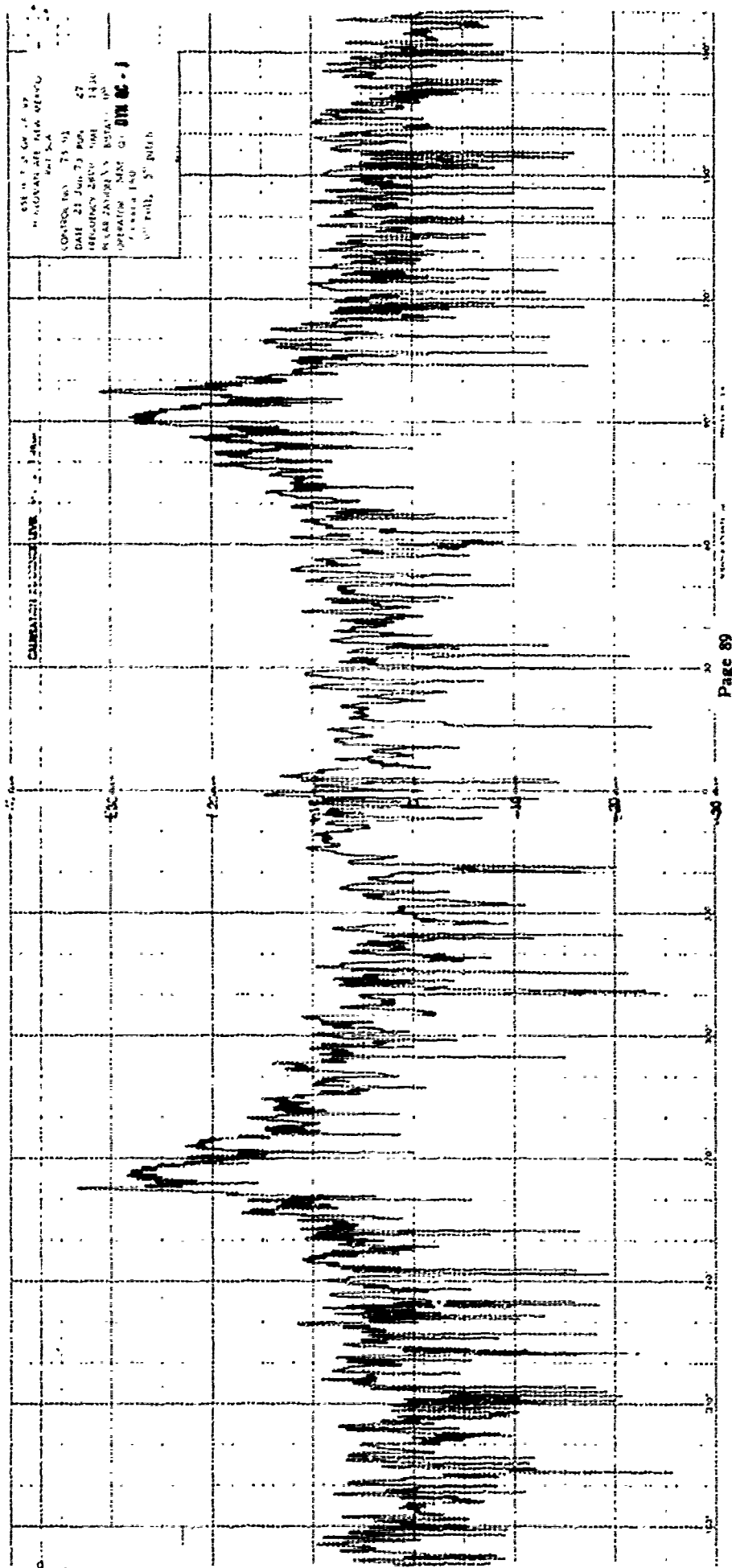




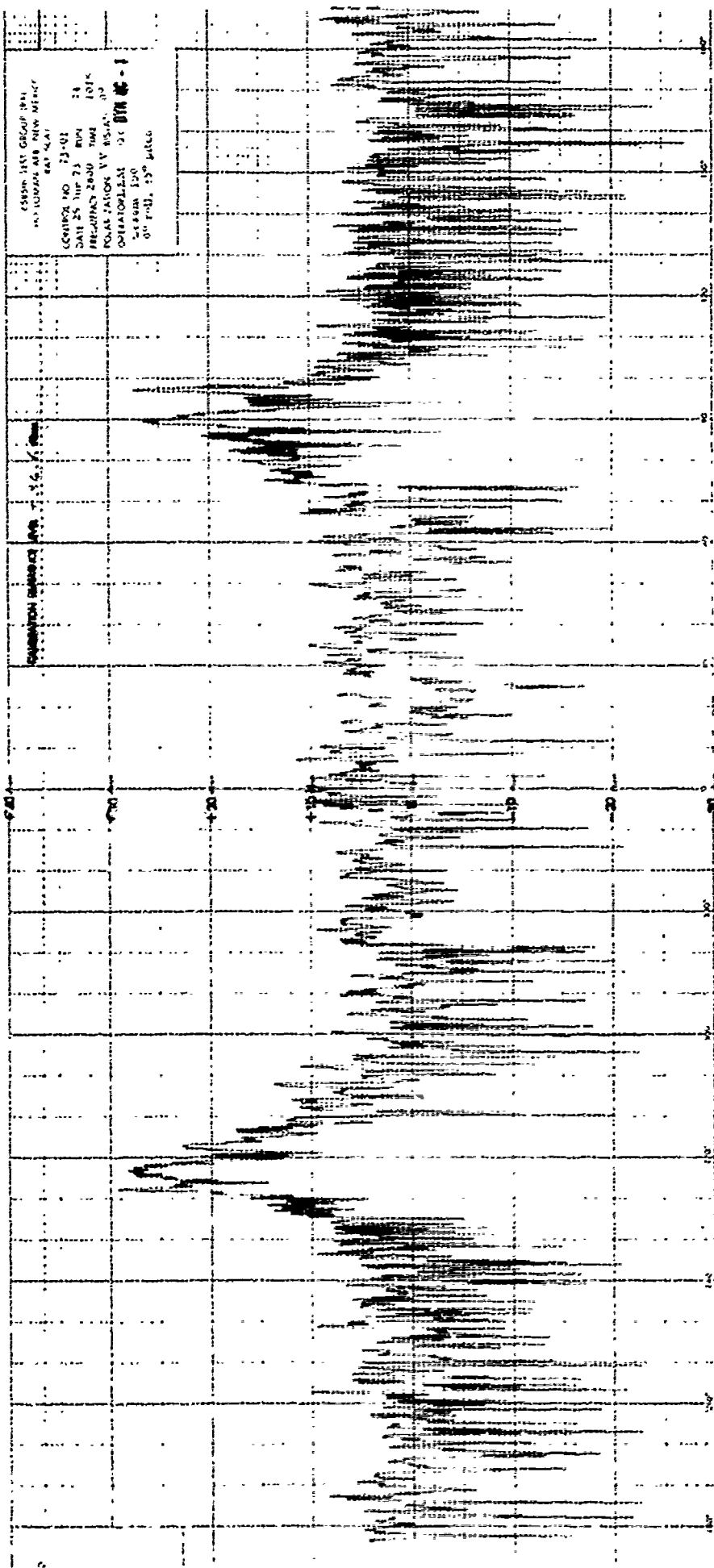
[illegible]

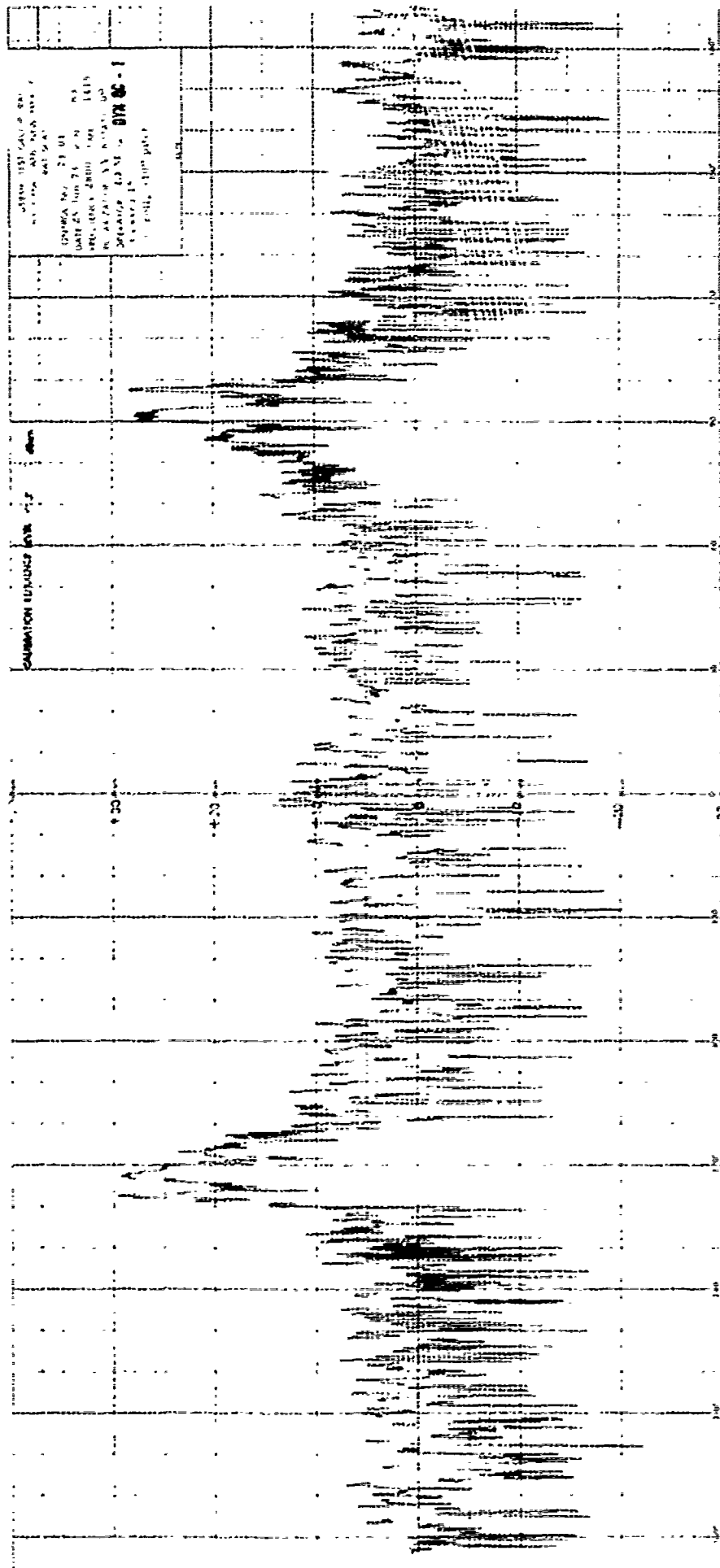


The image shows a document page that has been severely corrupted or redacted. It is covered with a grid of dashed lines. Numerous horizontal black bars of varying lengths and thicknesses obscure the original text. The bars are most concentrated in the upper and middle sections of the page, with some extending across the entire width. The overall appearance is one of a heavily damaged or censored document.

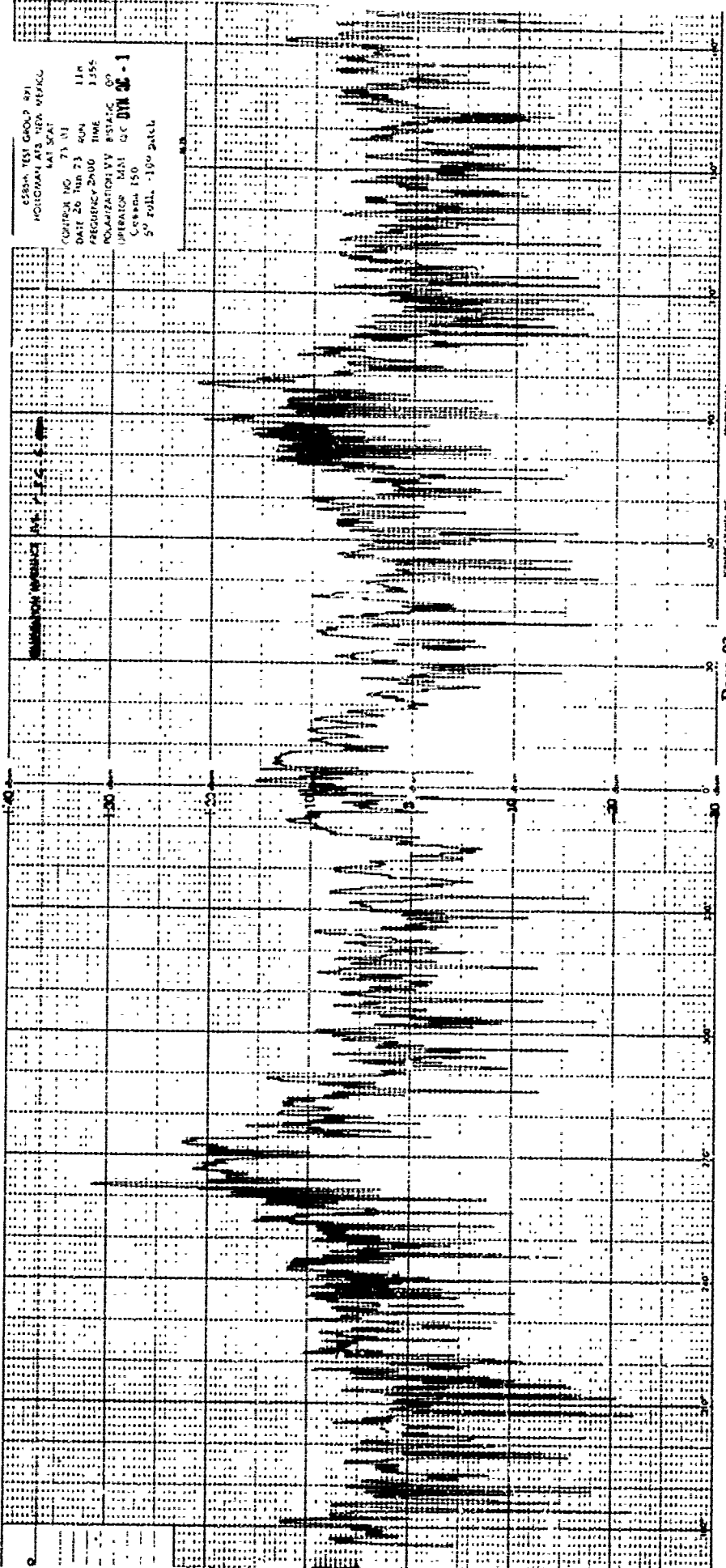








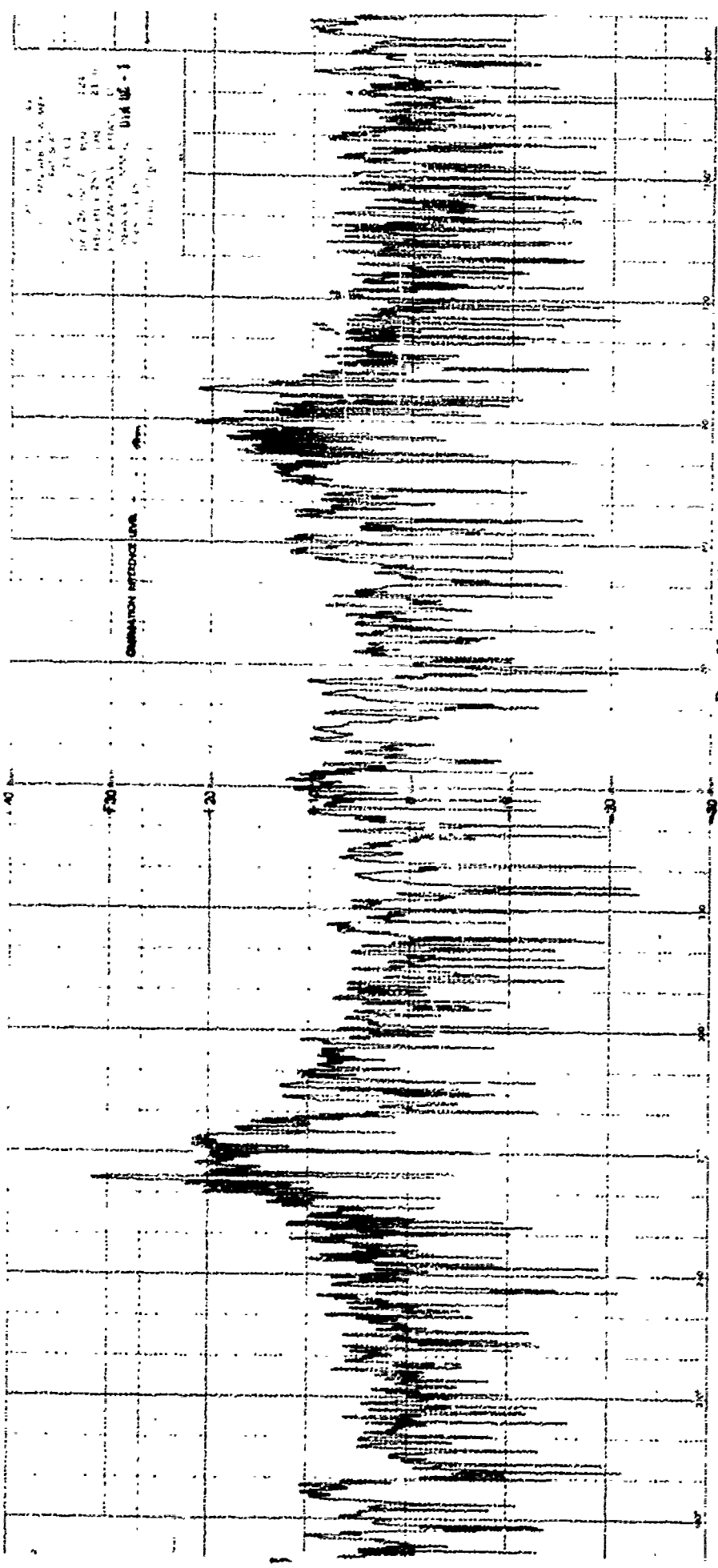
6588H TEST GROUP 471  
 HONGKONG AIR NEW MEXICO  
 LAT 34° 11'  
 LONG 118° 11'  
 DATE 26 Jun 73 004  
 FREQUENCY 2500 MHz  
 POLARIZATION VV  
 OPERATOR MAI G.C. **DM 35-1**  
 Coaxial 150  
 50' roll, -10° pitch



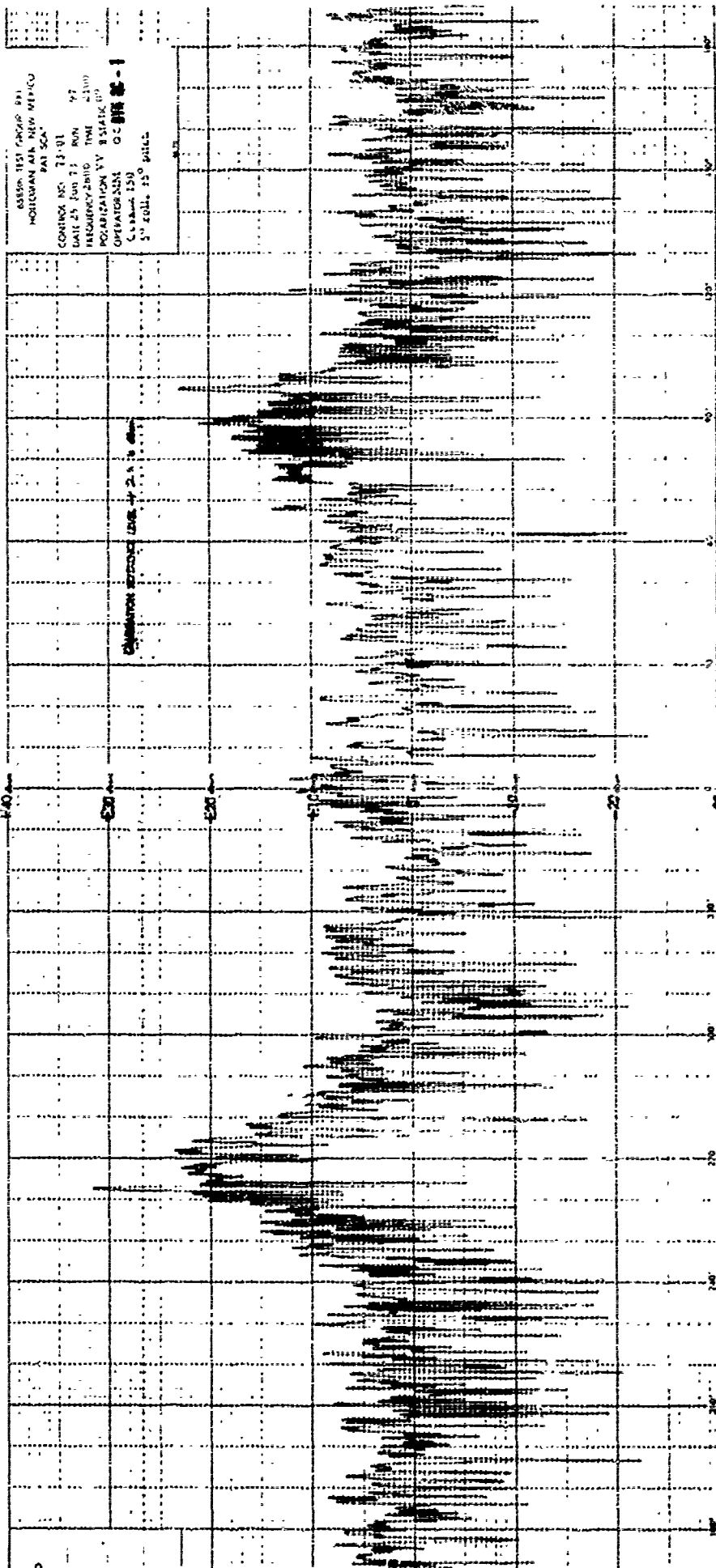
1-2

CAUTION MESSAGE

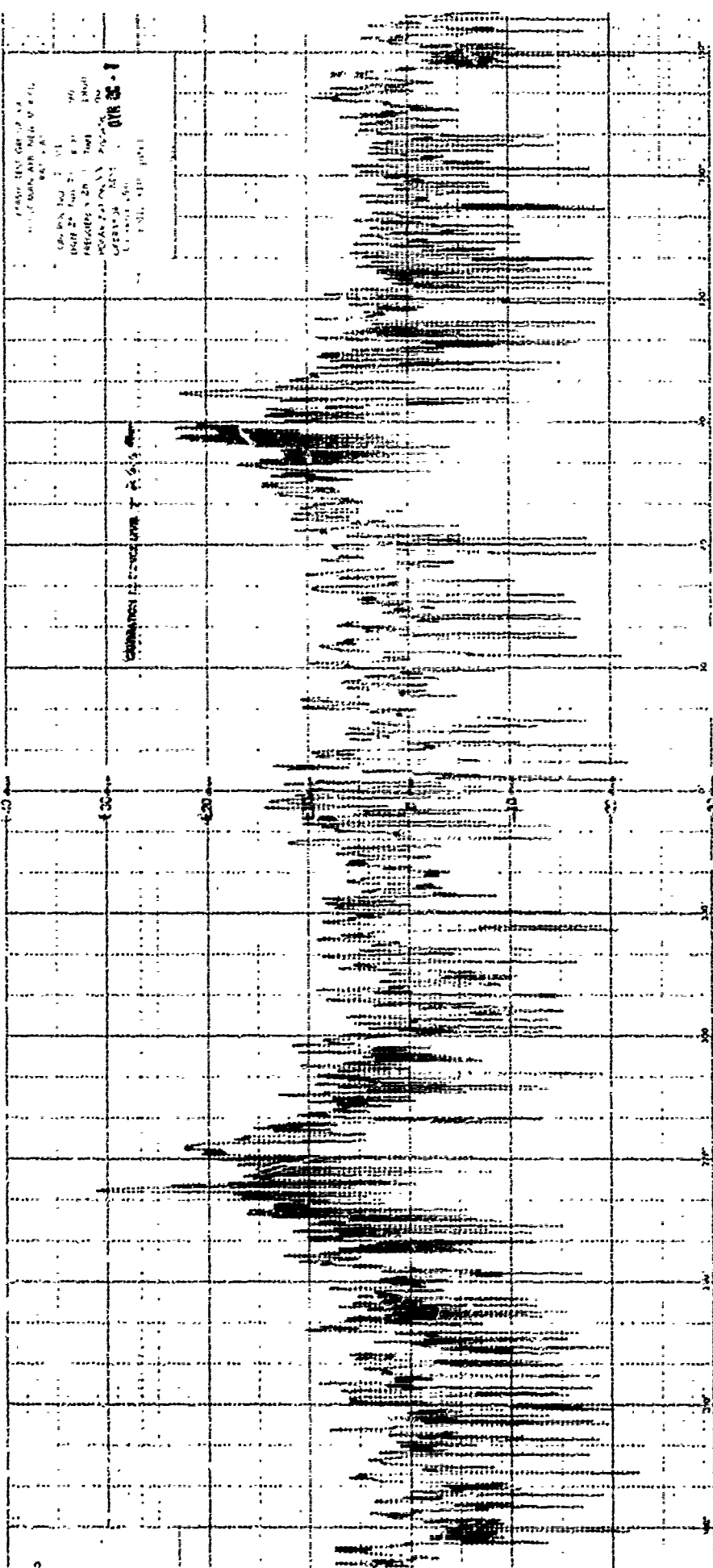
Page 94







OSCAR TEST GROUP 911  
HOLICMAN AIR NEW MEXICO  
PAT SCA  
CONTROL NO. 73-01  
DATE 25 Jun 73 RUN 97  
REMARKS/REMARK TIME 23:00  
REMARKS/REMARK TIME 23:00  
OPERATOR/OPERATOR 0-0-0-0-0-0  
CUBAN 150  
50 ZOLL 15 PILE



65000 11. 100 0 10  
100 100000 100 100  
100 100 100

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ASMA TEST GROUP 800  
HOLCOMB AFB, NEW MEXICO

SAT 501

COUNTRY NO 73-01

BATH 21 JUNE 73 WFT 144

FREQUENCY 2000 THW 1235

POLARIZATION VV INSTANT 9°

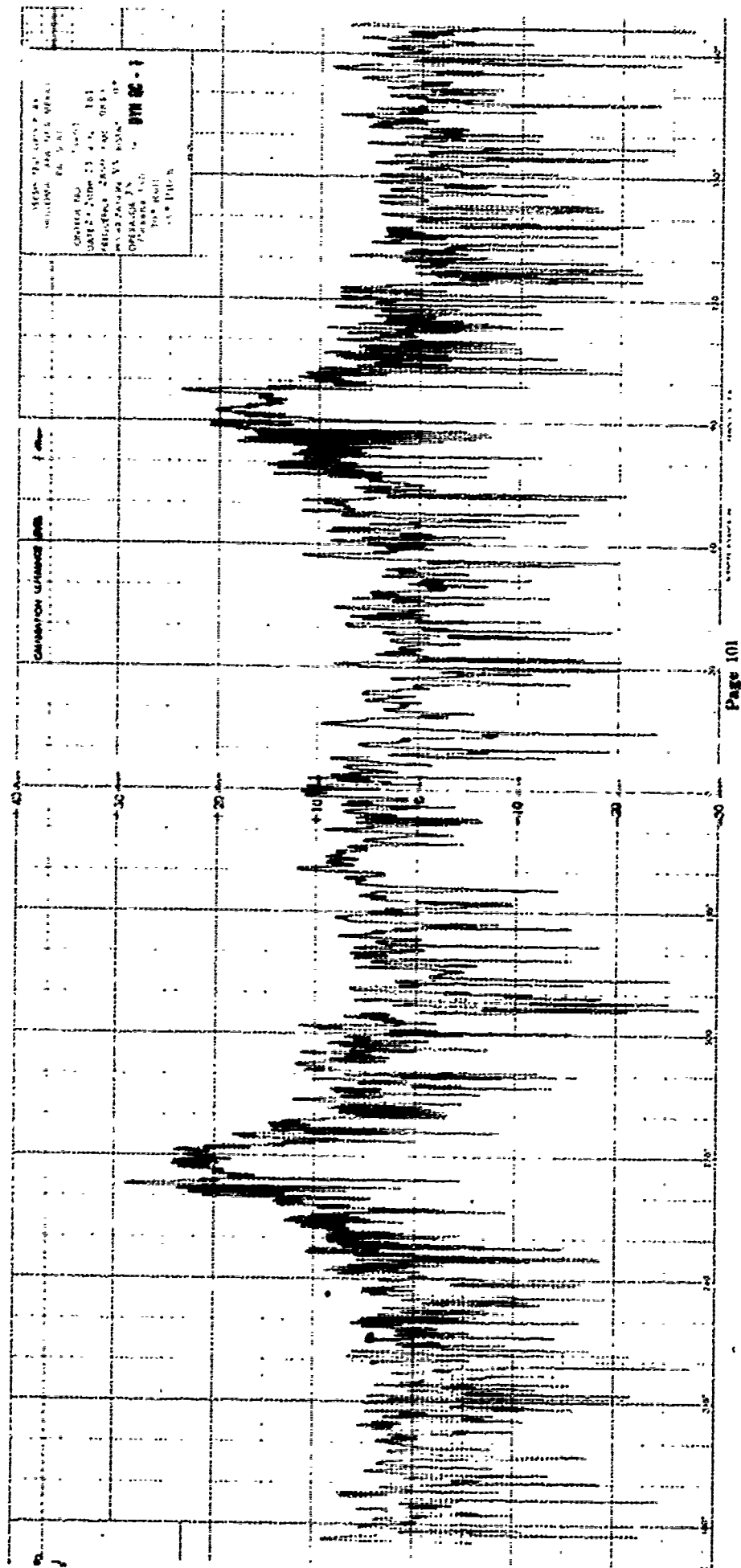
OPERATOR J3 G.C. 800 5-1

CANADA 150

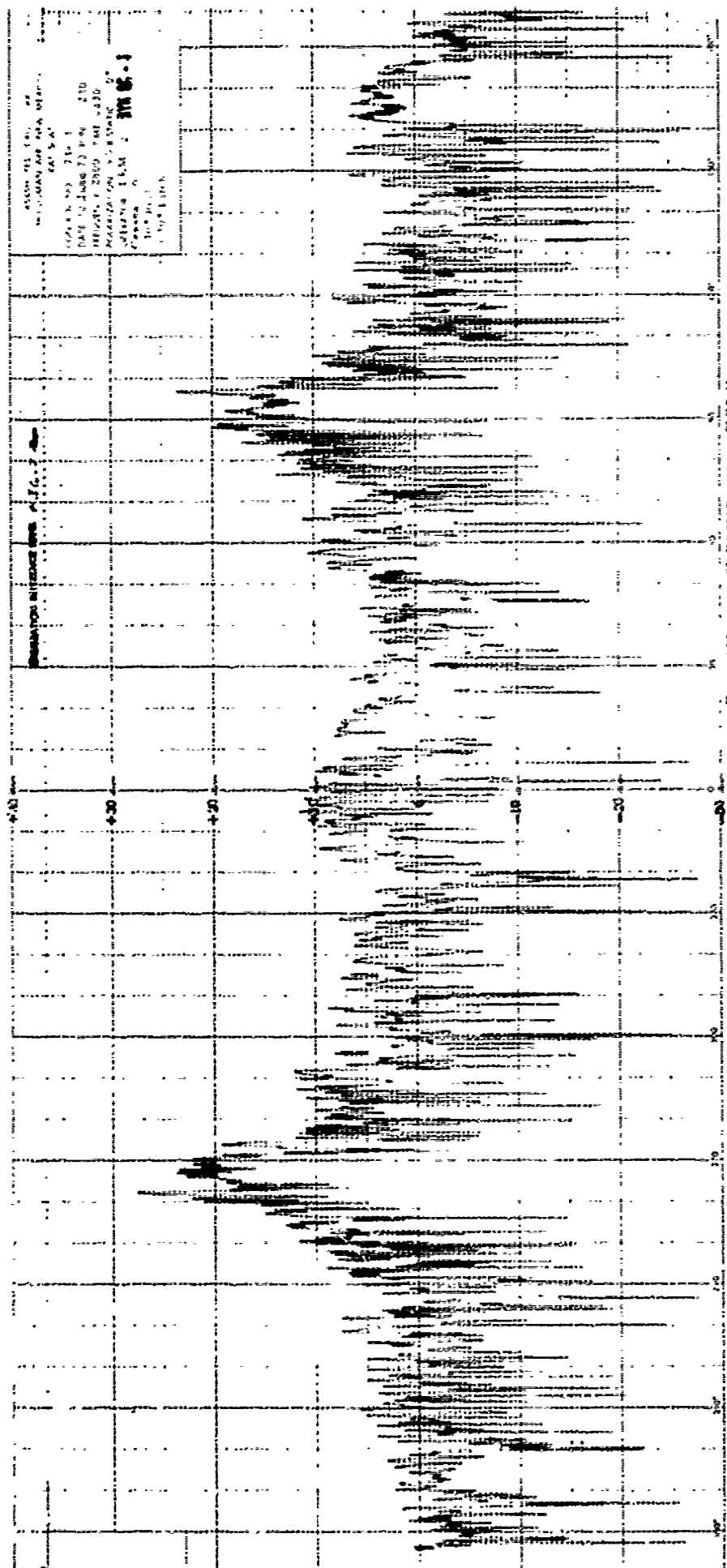
10° Malt

-3° Pitch

AREA 100 SOUTH 100T  
HOLMAN AIR, NEW MEXICO  
SAT SAT  
CONTRACT NO. 77-01  
CALL 27 June 73 1000 1.2  
RECEIVED FROM 10000000  
RECEIVED FROM 10000000  
OPERATION 100T  
100T 100T  
100T 100T  
100T 100T



MEAN 101 101 101  
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DATE 20 101 101  
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BY 101 101 101  
101 101 101

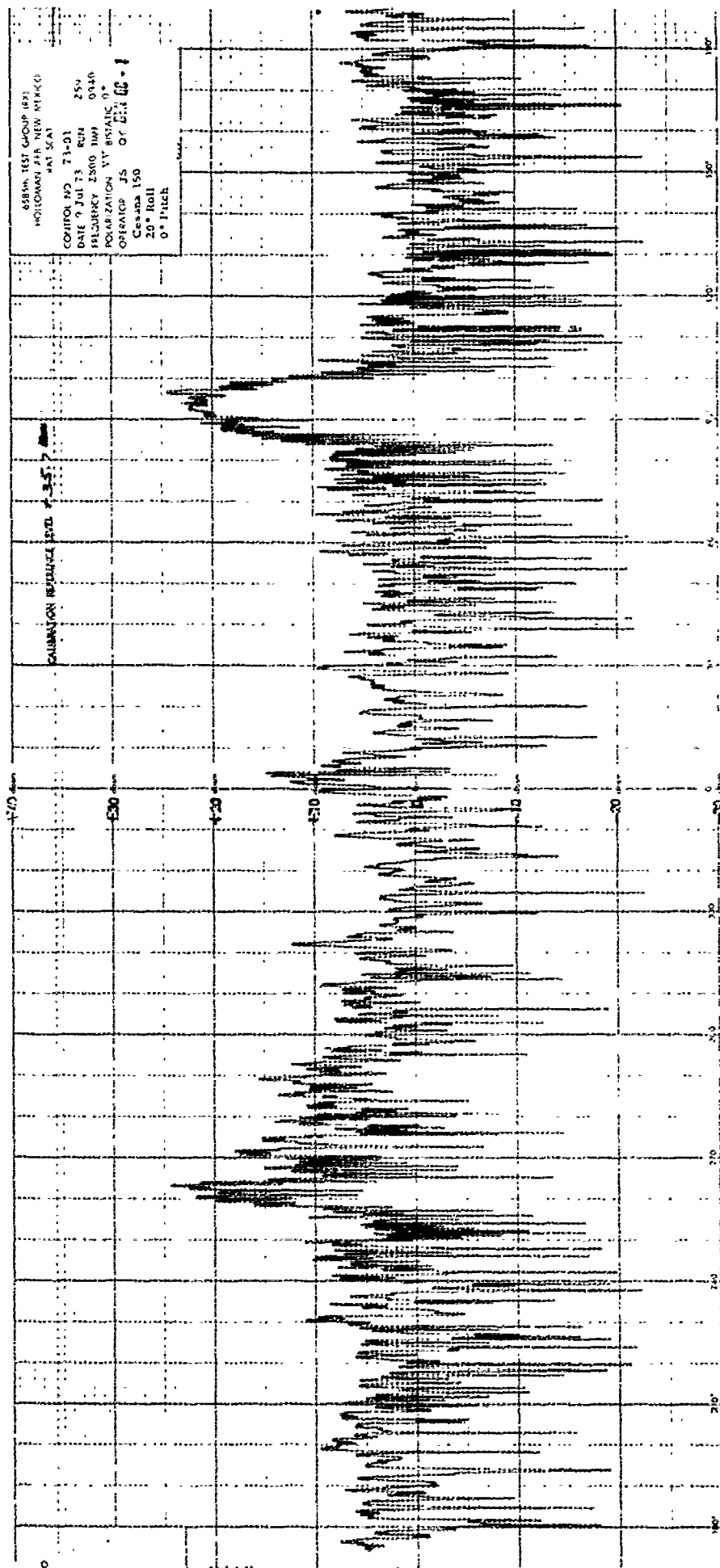


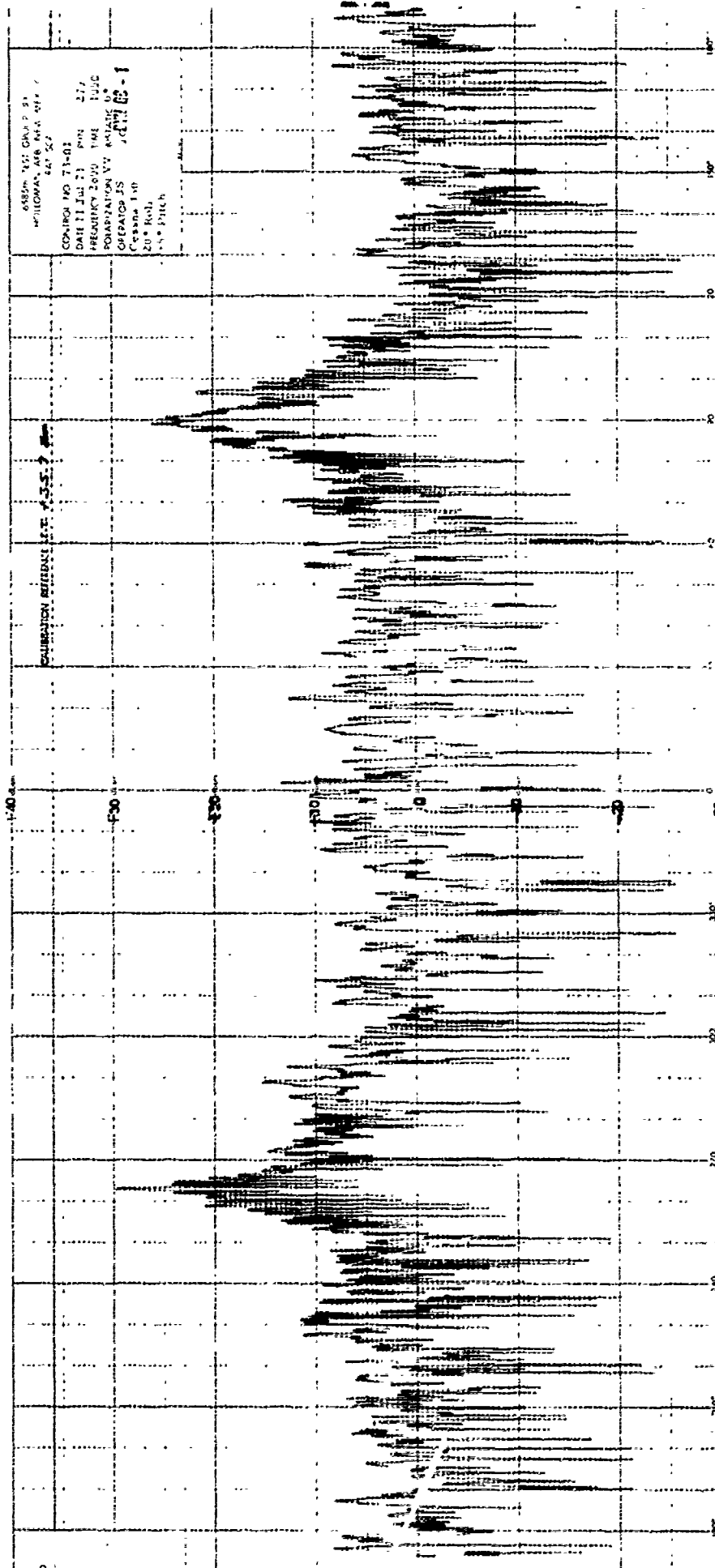


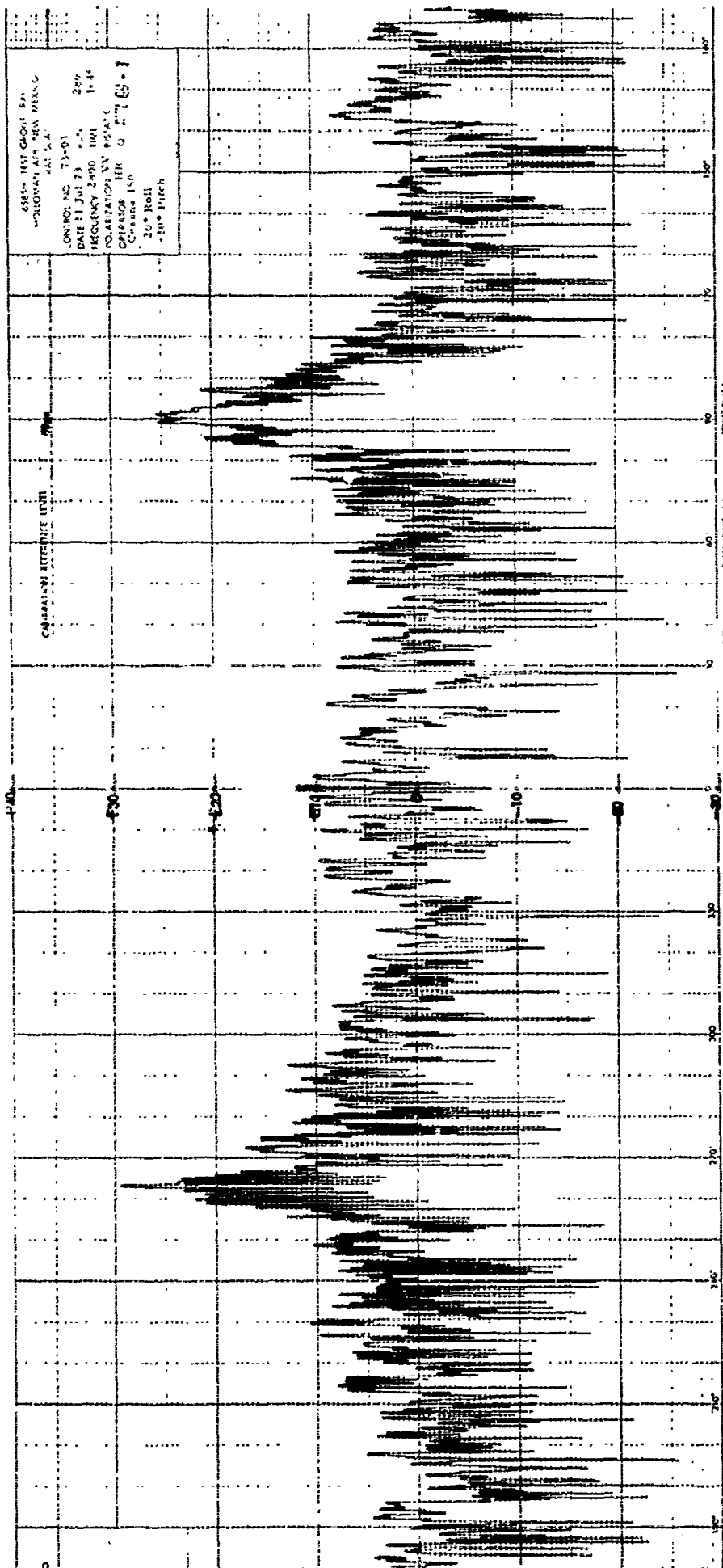


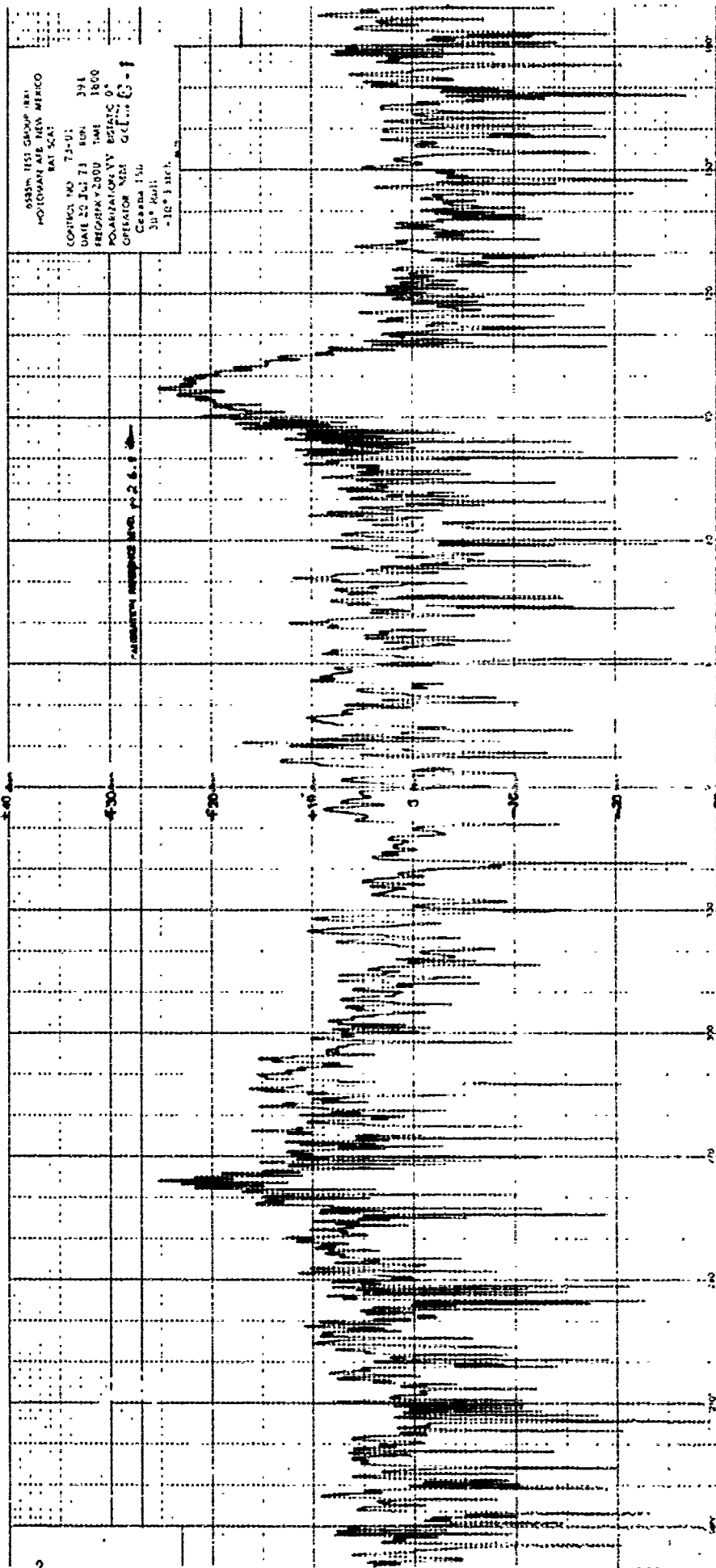
DATE	DESCRIPTION	AMOUNT	BALANCE
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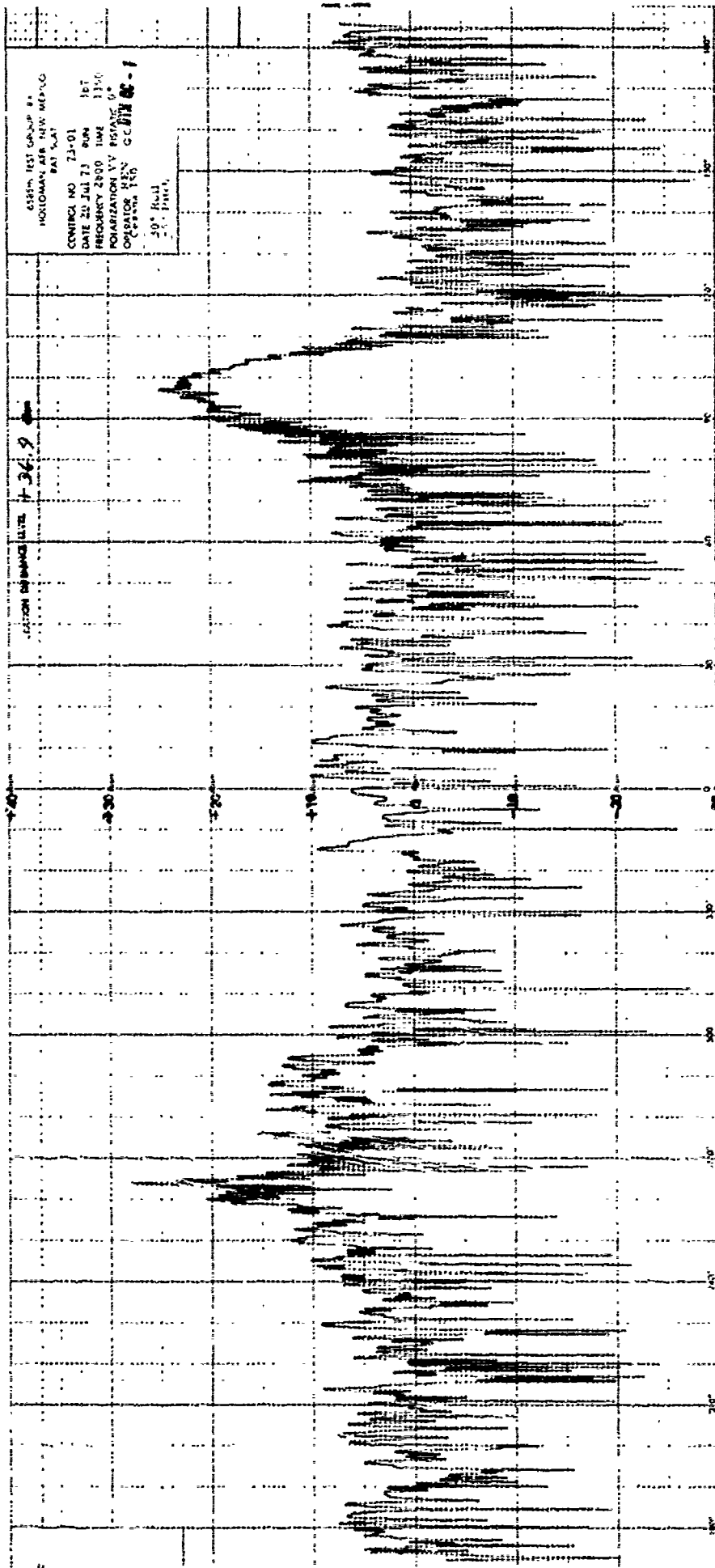
2000

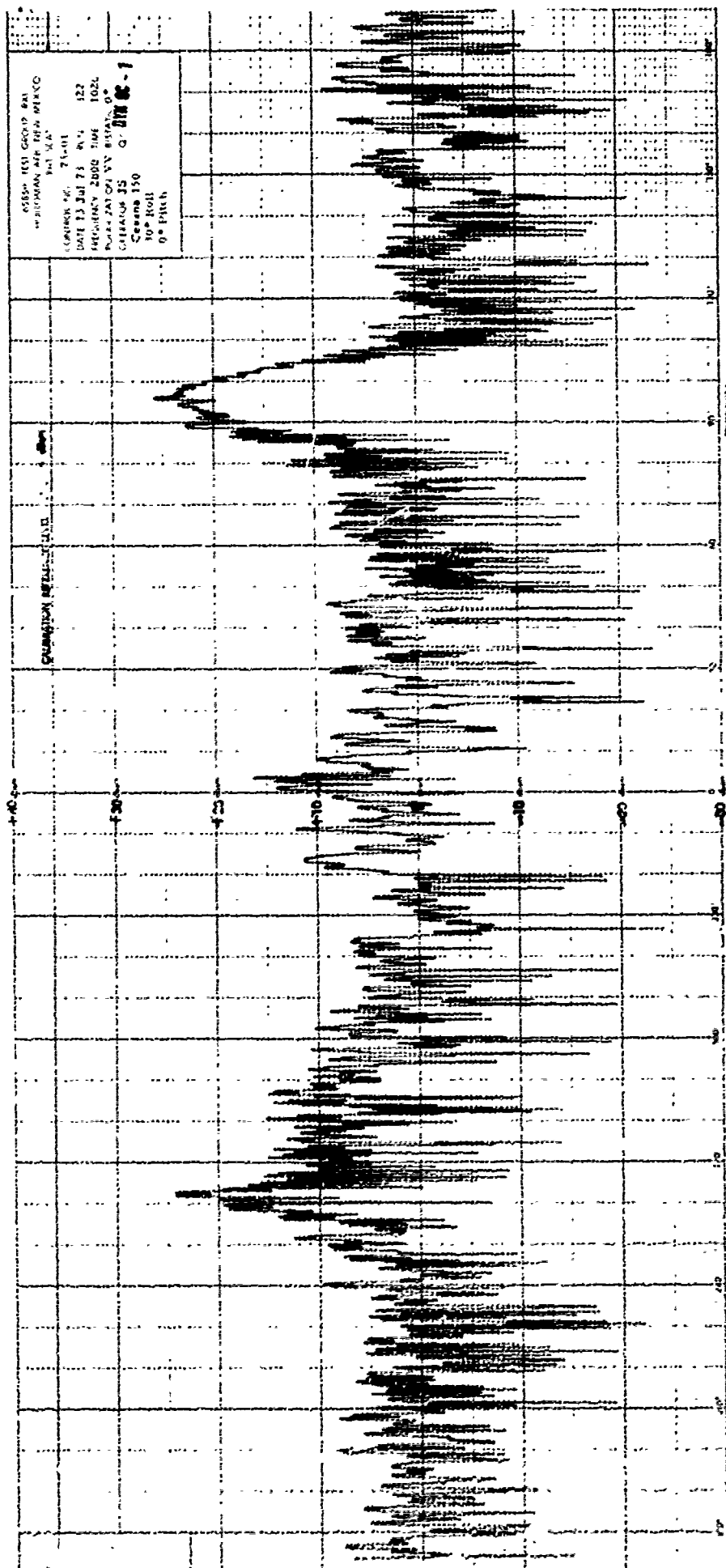


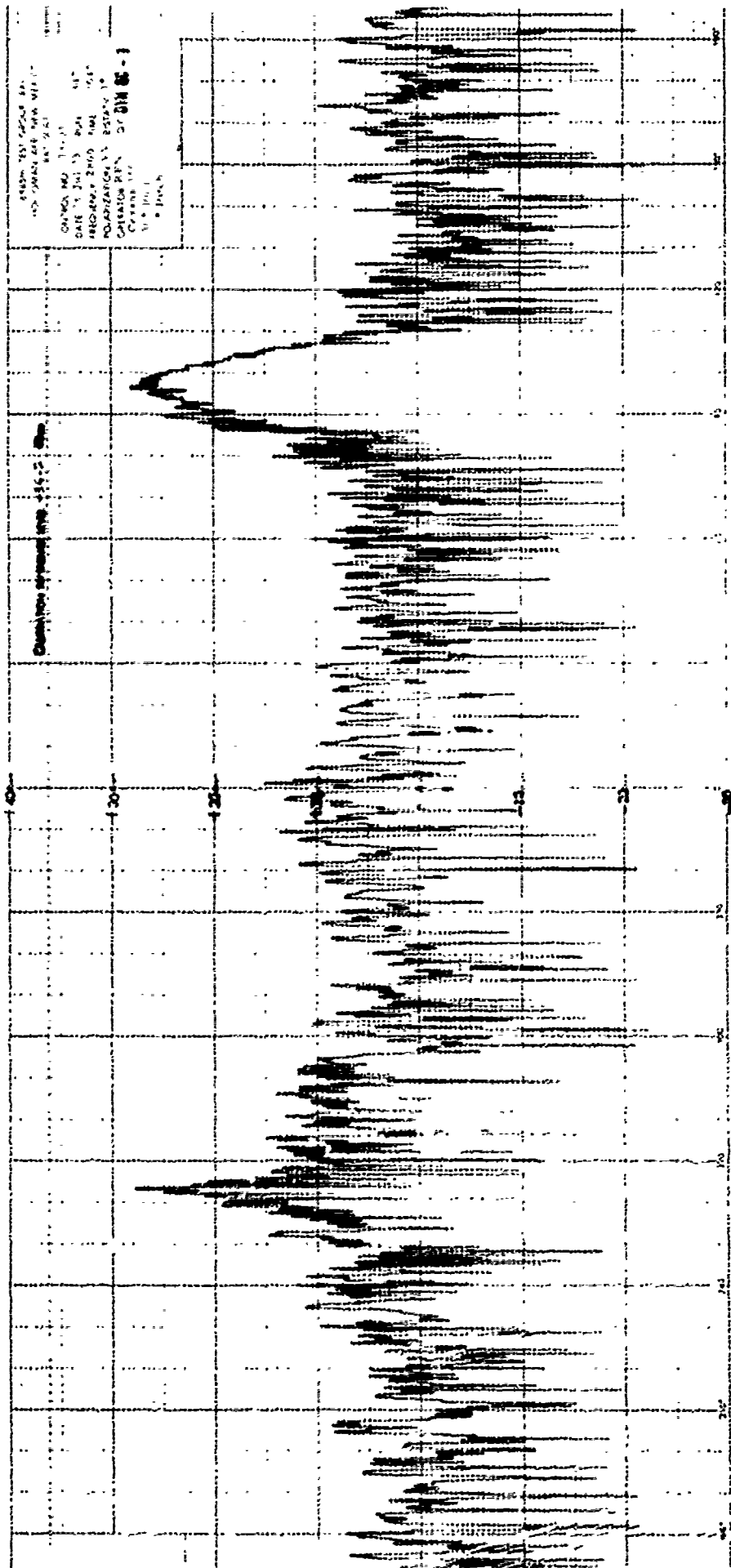




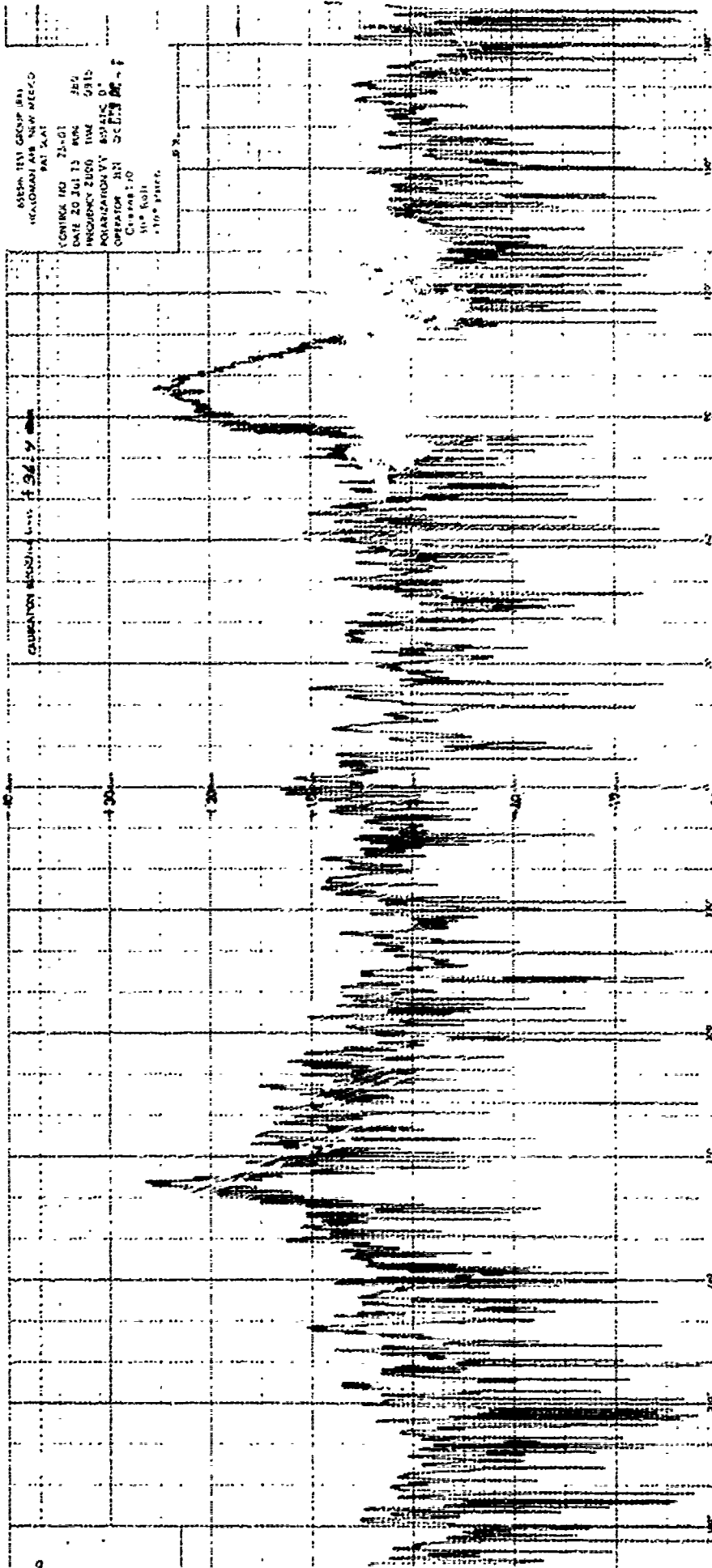






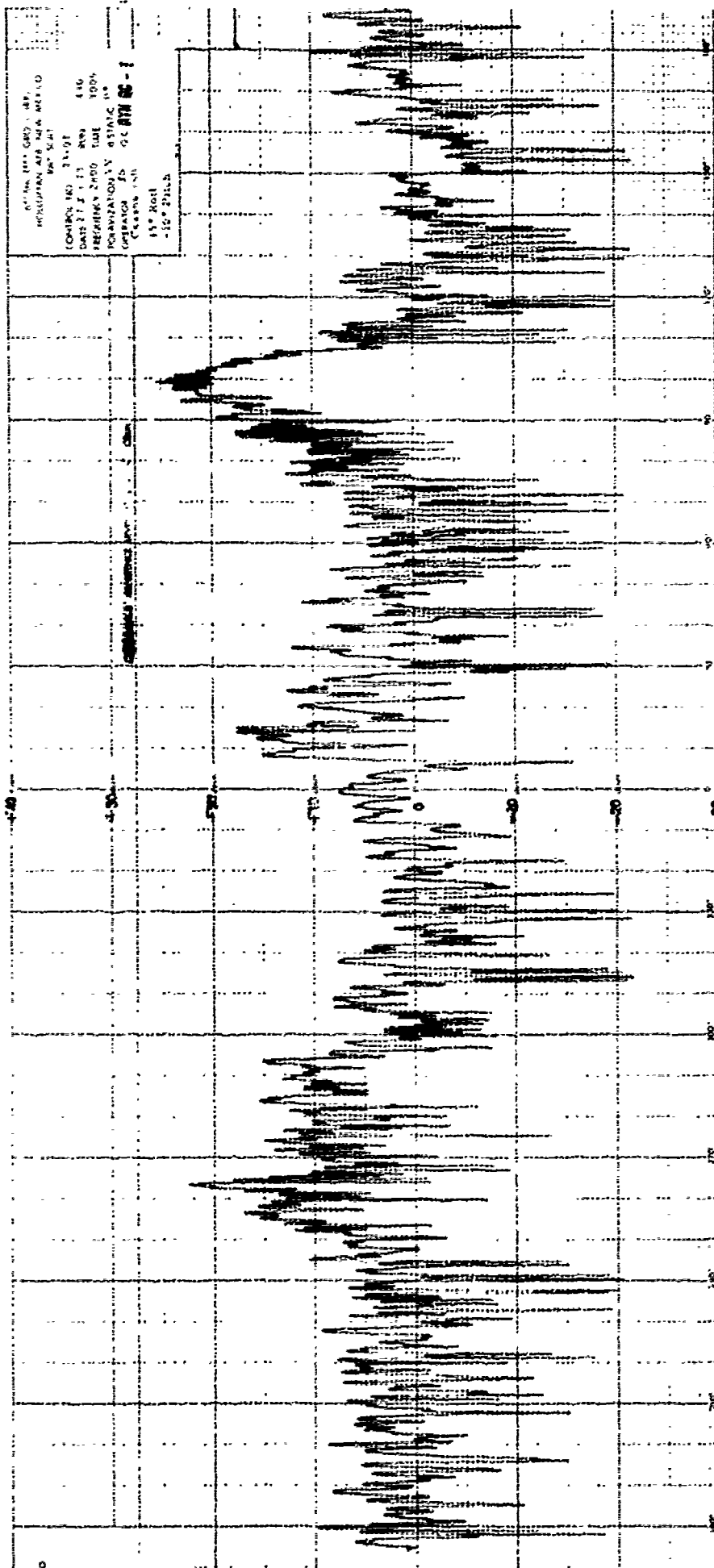




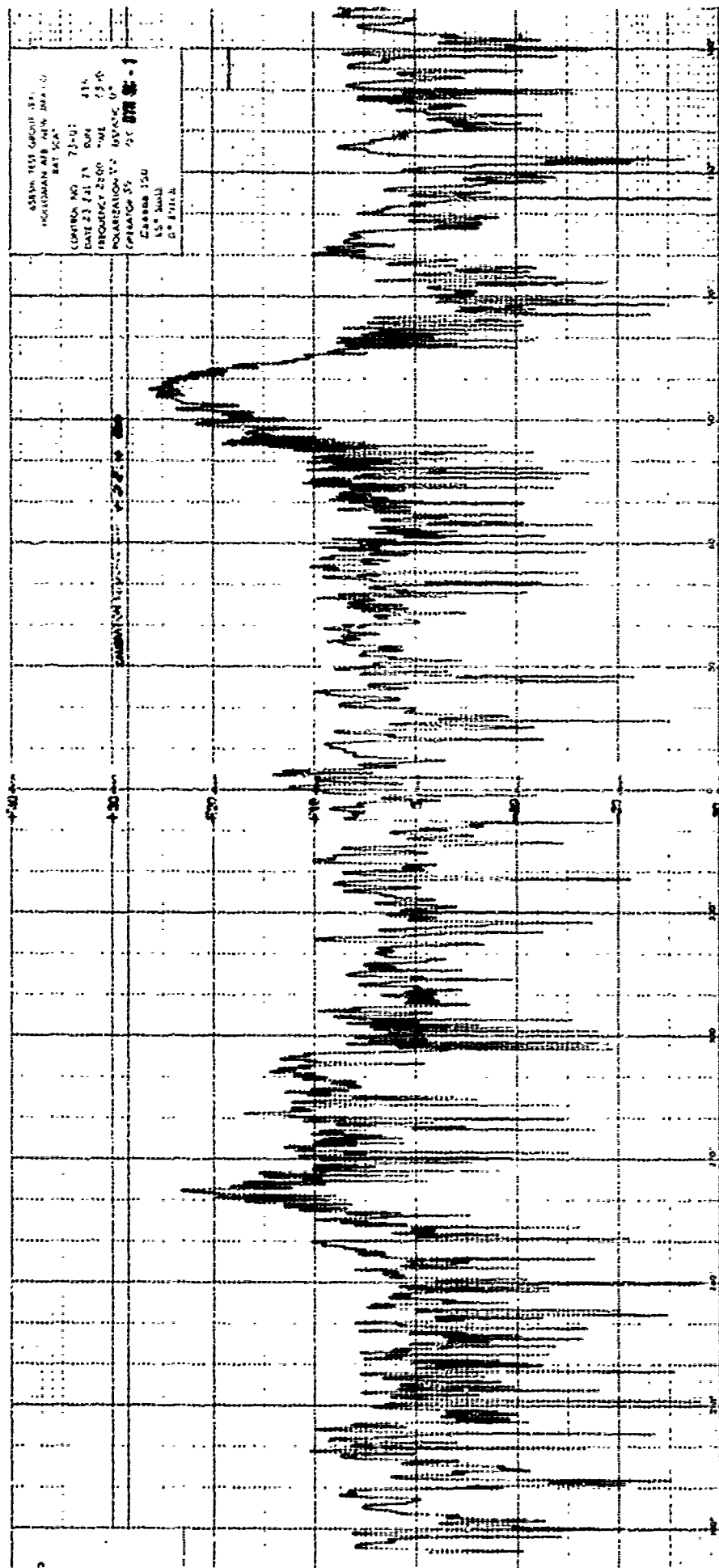


DEPT. TEST GROUP 341  
HEADQUARTERS NEW MEXICO  
PAT. 341  
CONTINGENT 21-01  
DATE 20 JUL 73 FROM JEU  
INQUIRY 2000 TIME 0815  
ORGANIZATION VV BUREAU 0  
OPERATOR 341 20 JUL 73  
Crews: 10  
10000000  
10000000

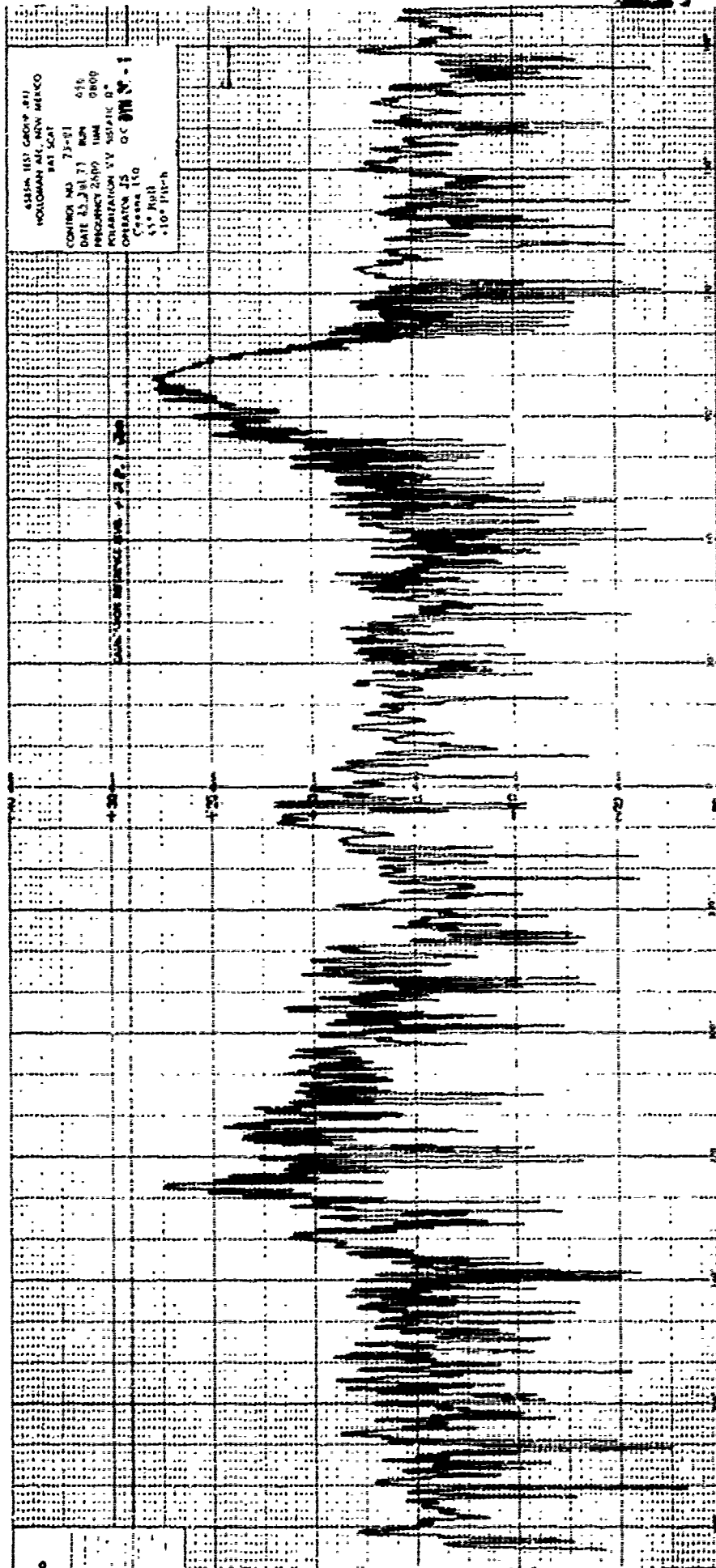
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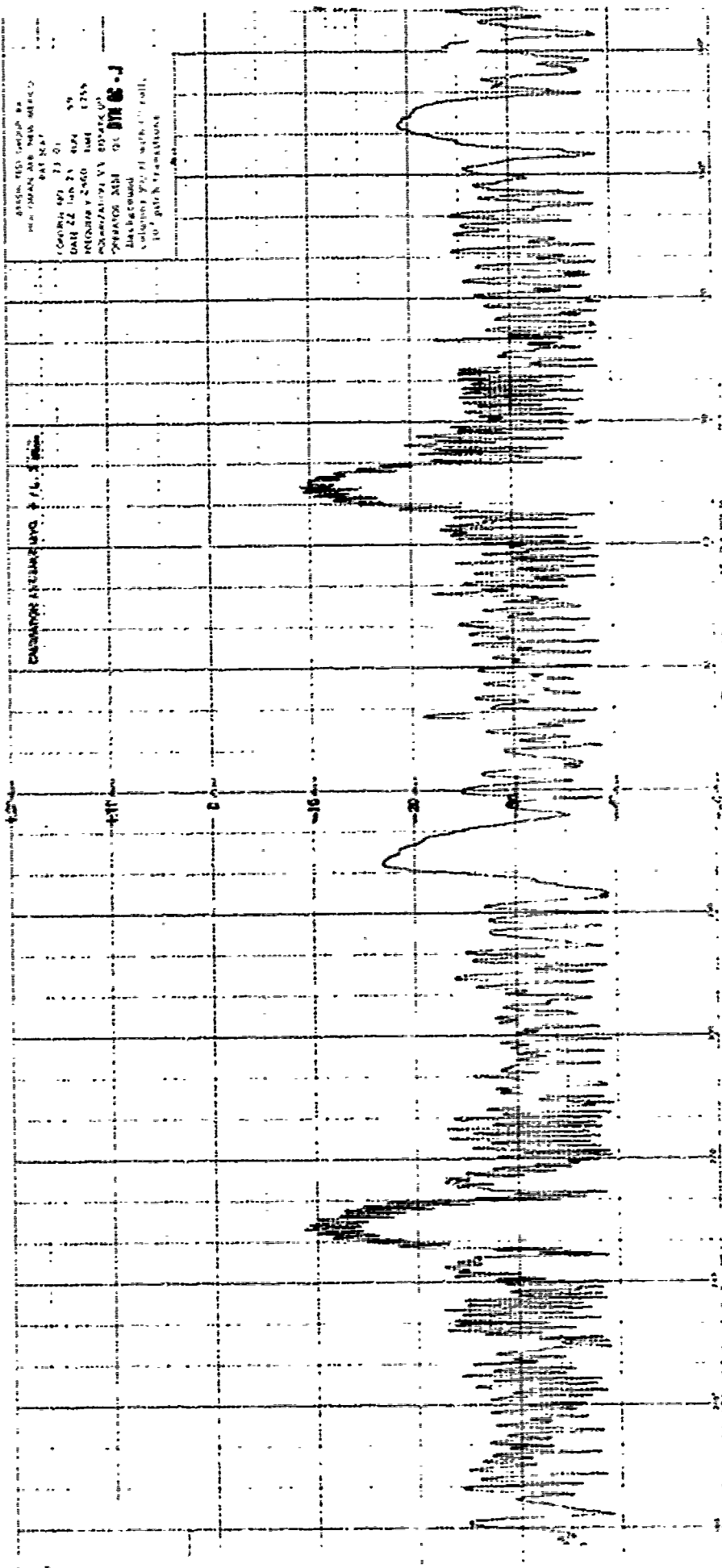


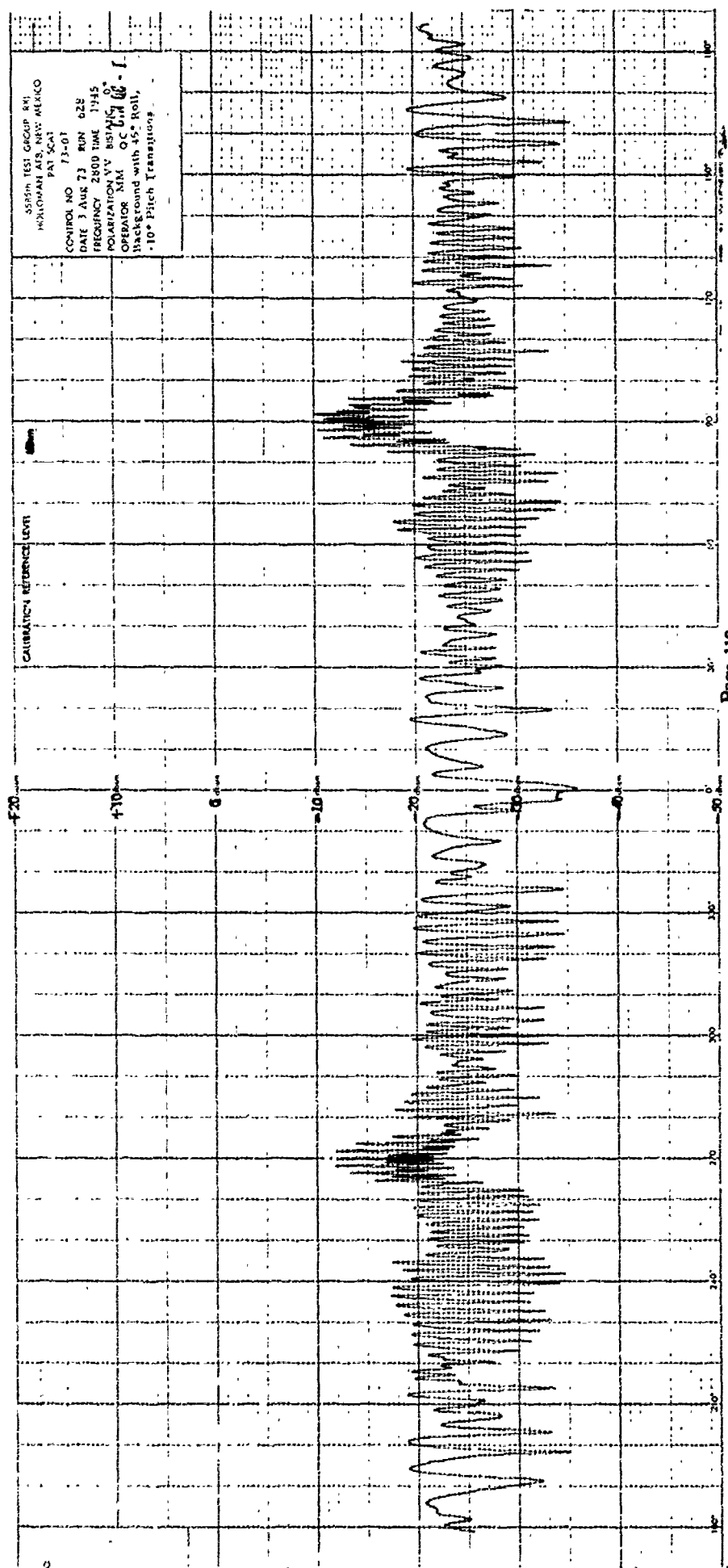
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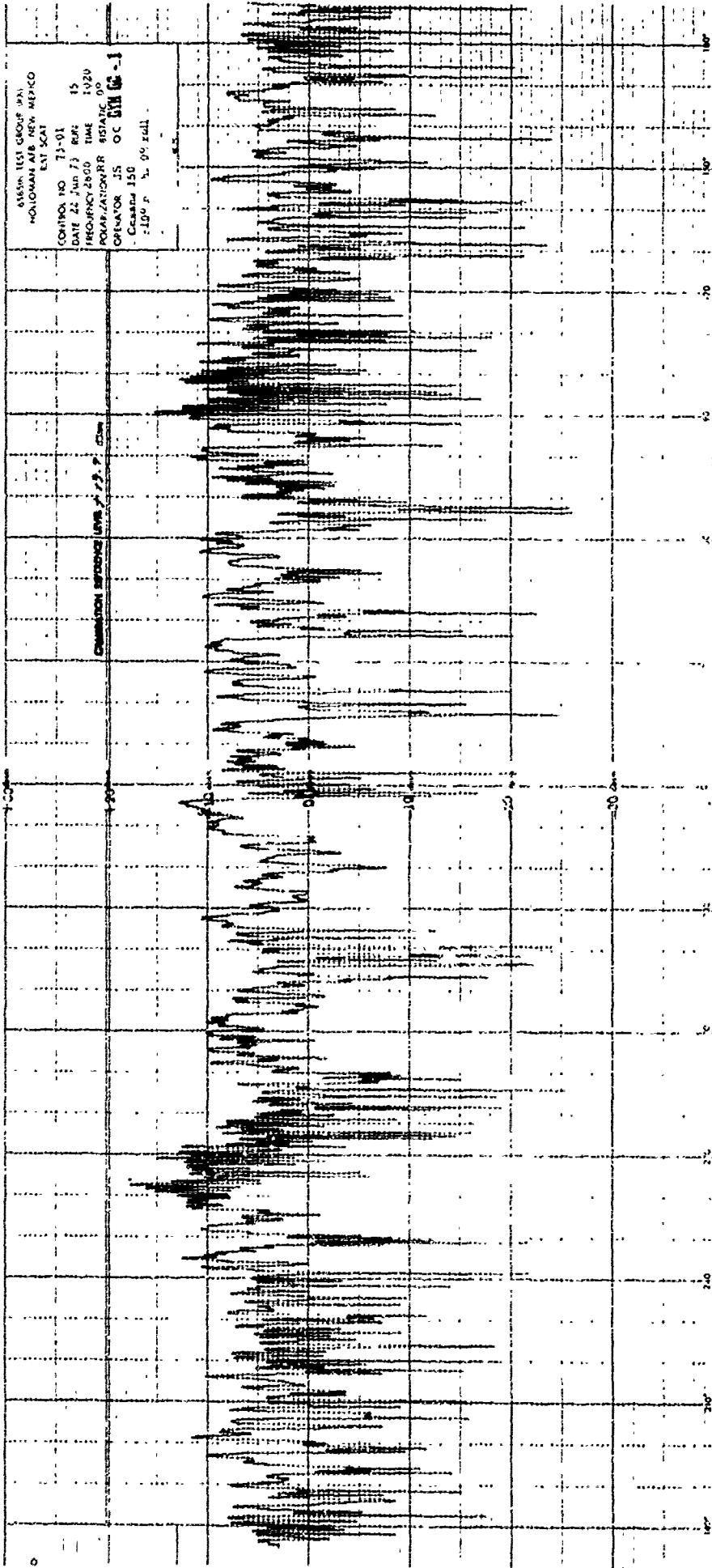


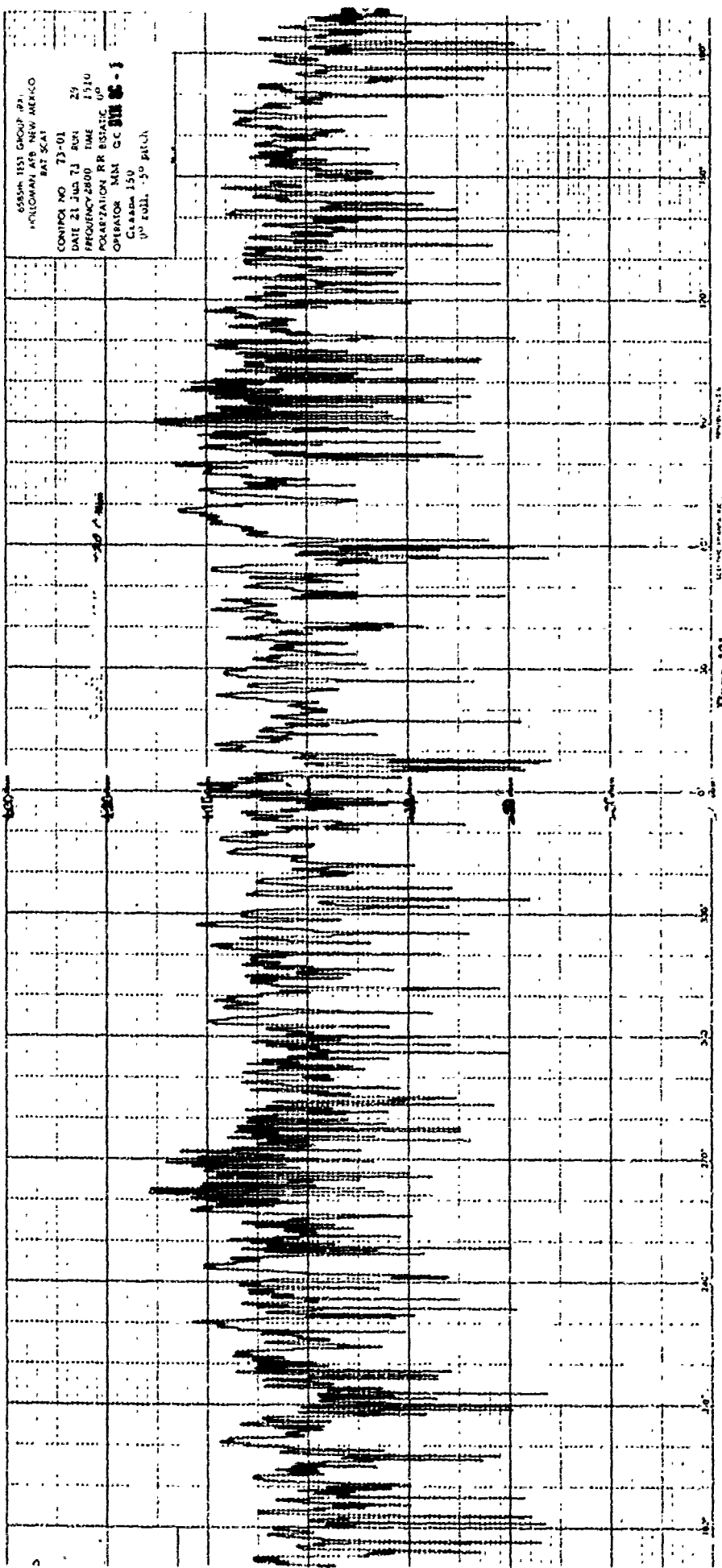






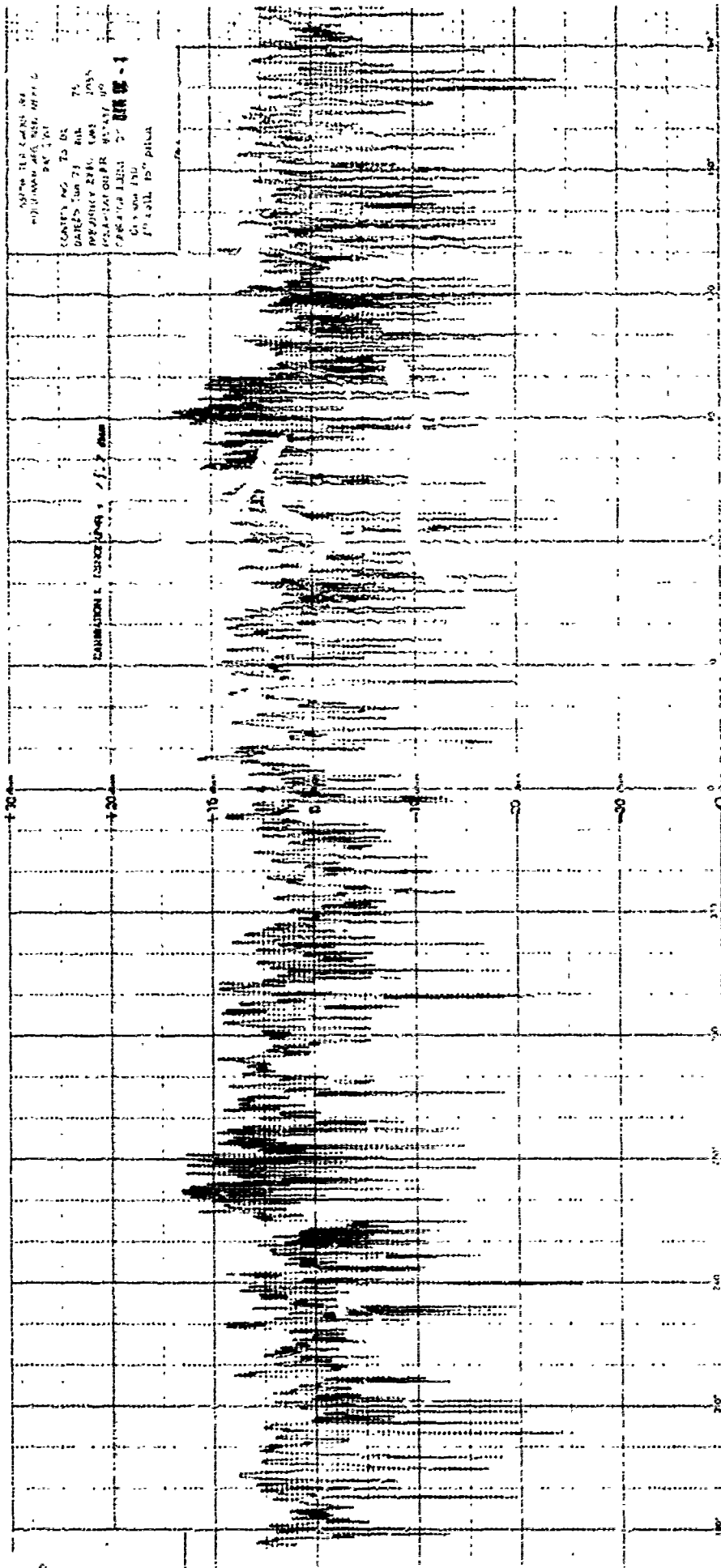




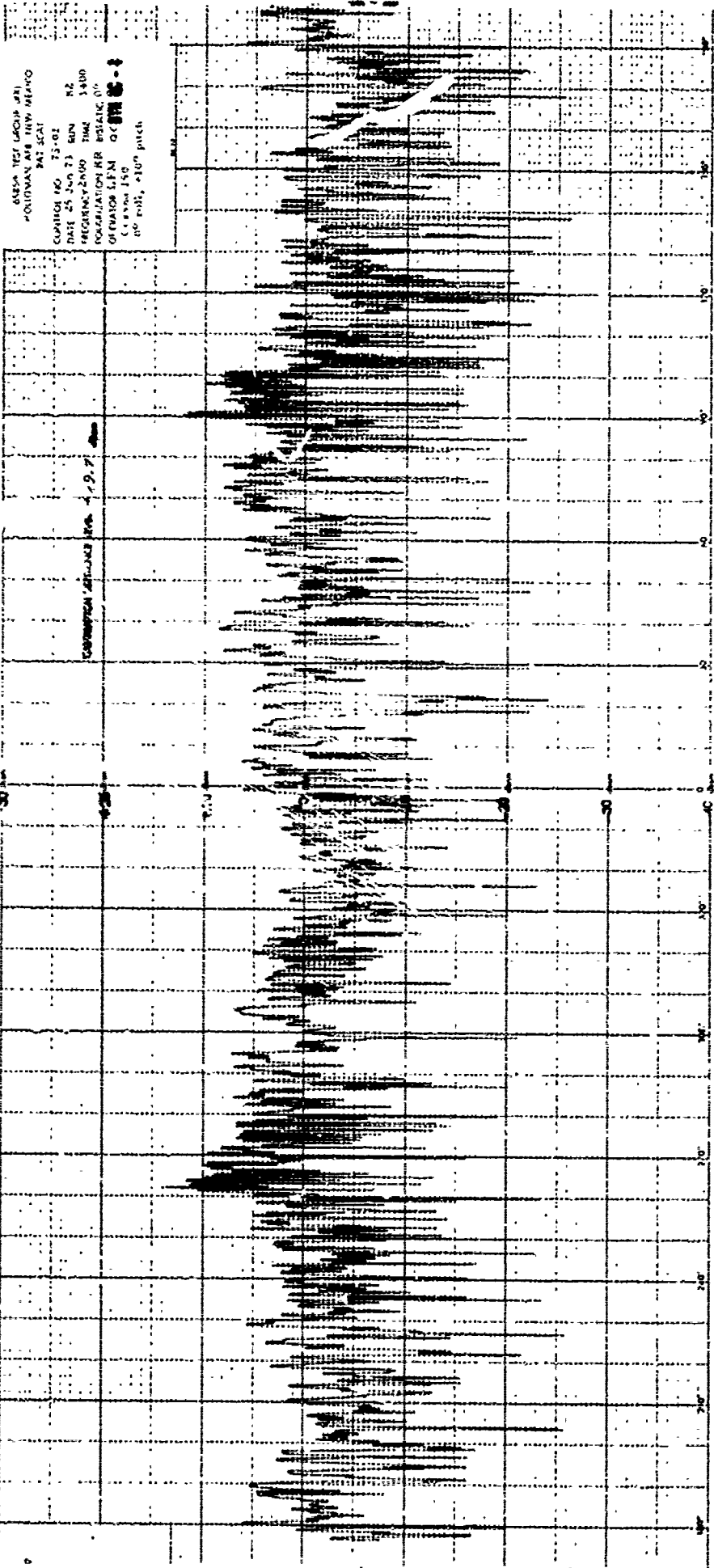


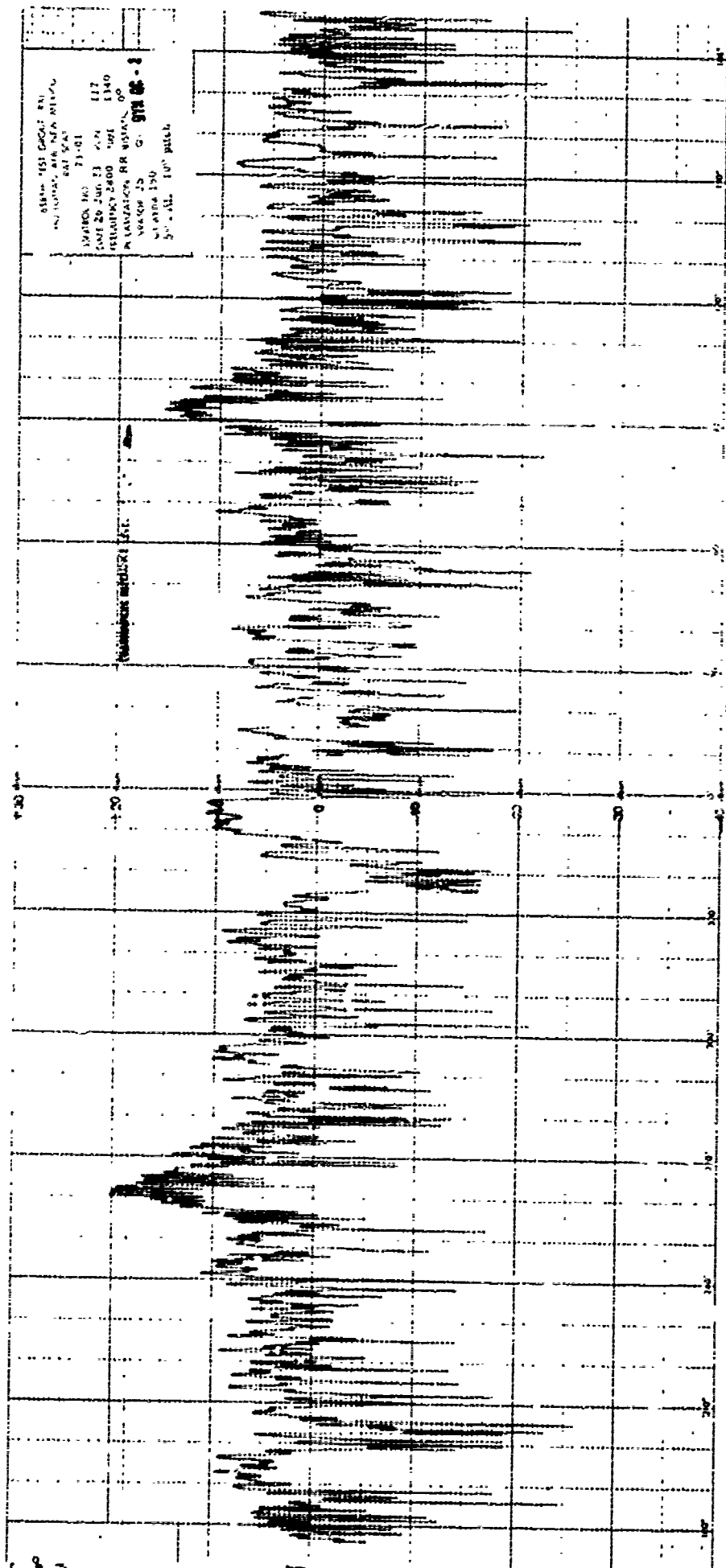
**Судья**

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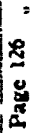


AREA TEST GROUP (B)  
 "QUINMAN AIR TOW REPORT"  
 PAT. CAT.  
 CONTROL NO. 75-01  
 DATE 25 JUN 75 RUN N2  
 REGISTRATION TIME 1400  
 REGISTRATION RR BASIC 01  
 OPERATOR LEM QCC 0100-01  
 CRAWLER 150  
 80 m/s, +100° pitch

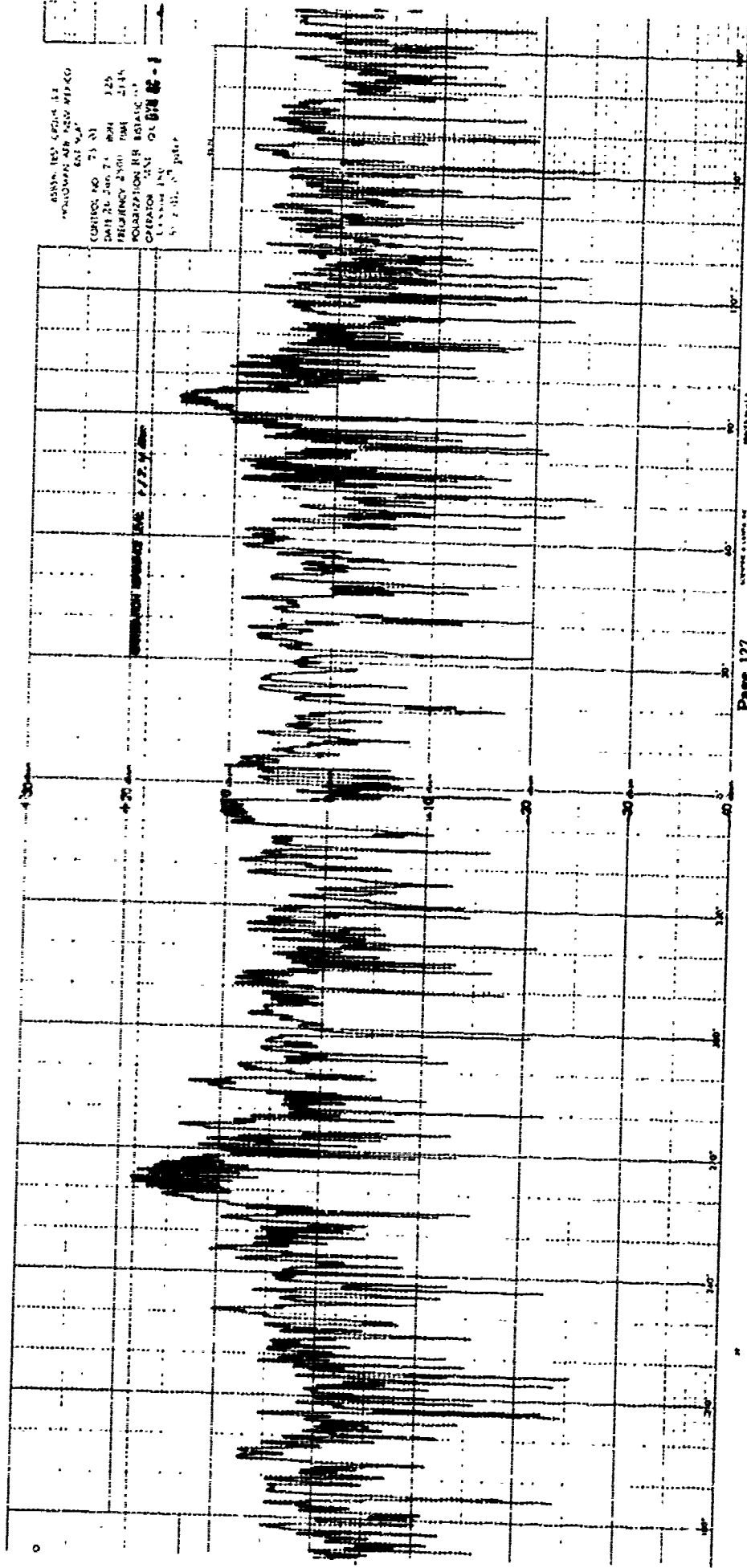




1944-1945



ANNA, INC. 601-11-11  
WILSON, AR 601-11-11  
601-11-11  
CONTROL NO. 71-01 125  
DATE 26 Jan 71 094 214  
FREQUENCY 2500 Hz  
POLARIZATION RR E814C  
OPERATOR JEN 01 078 00-1  
Lewins Inc  
601-11-11 paper

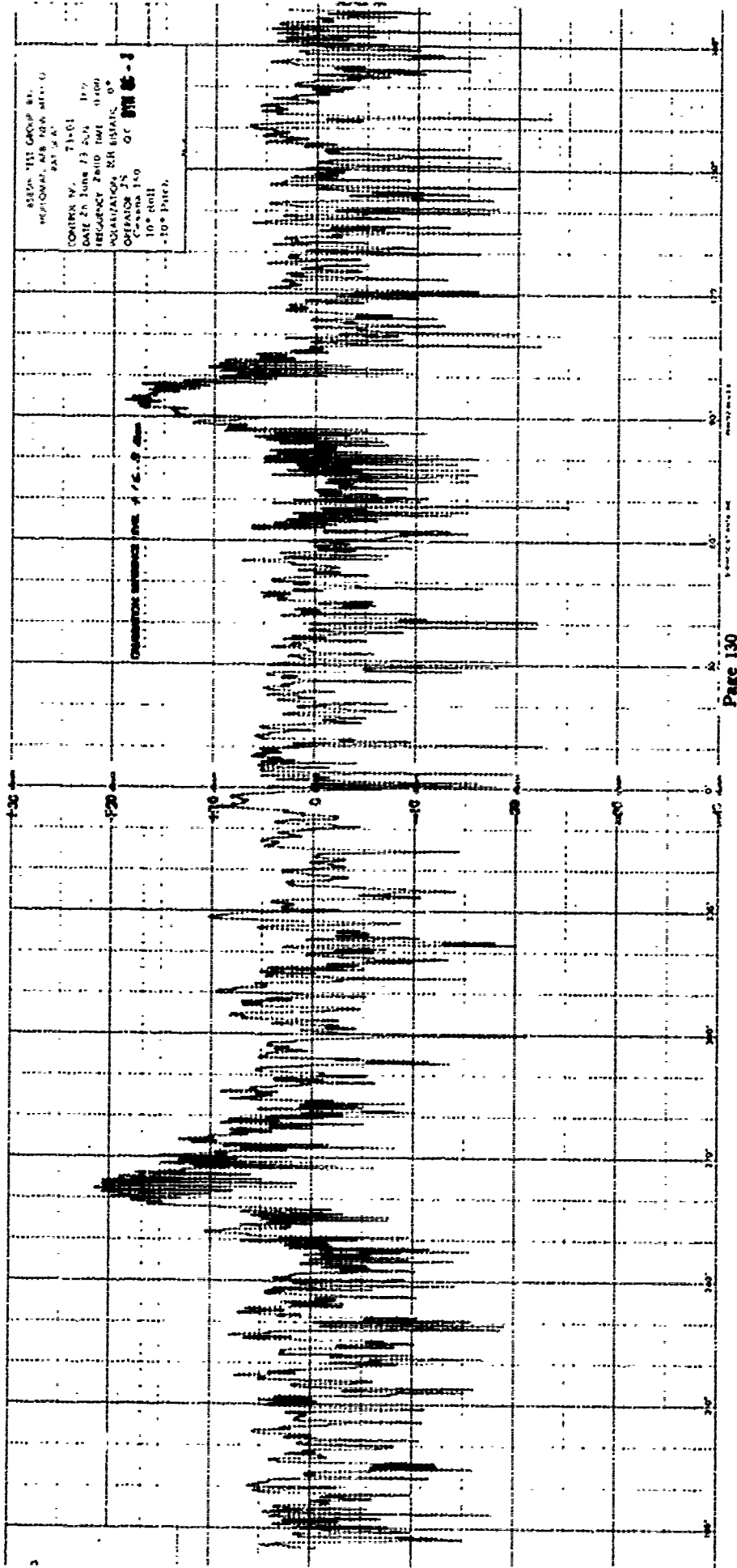




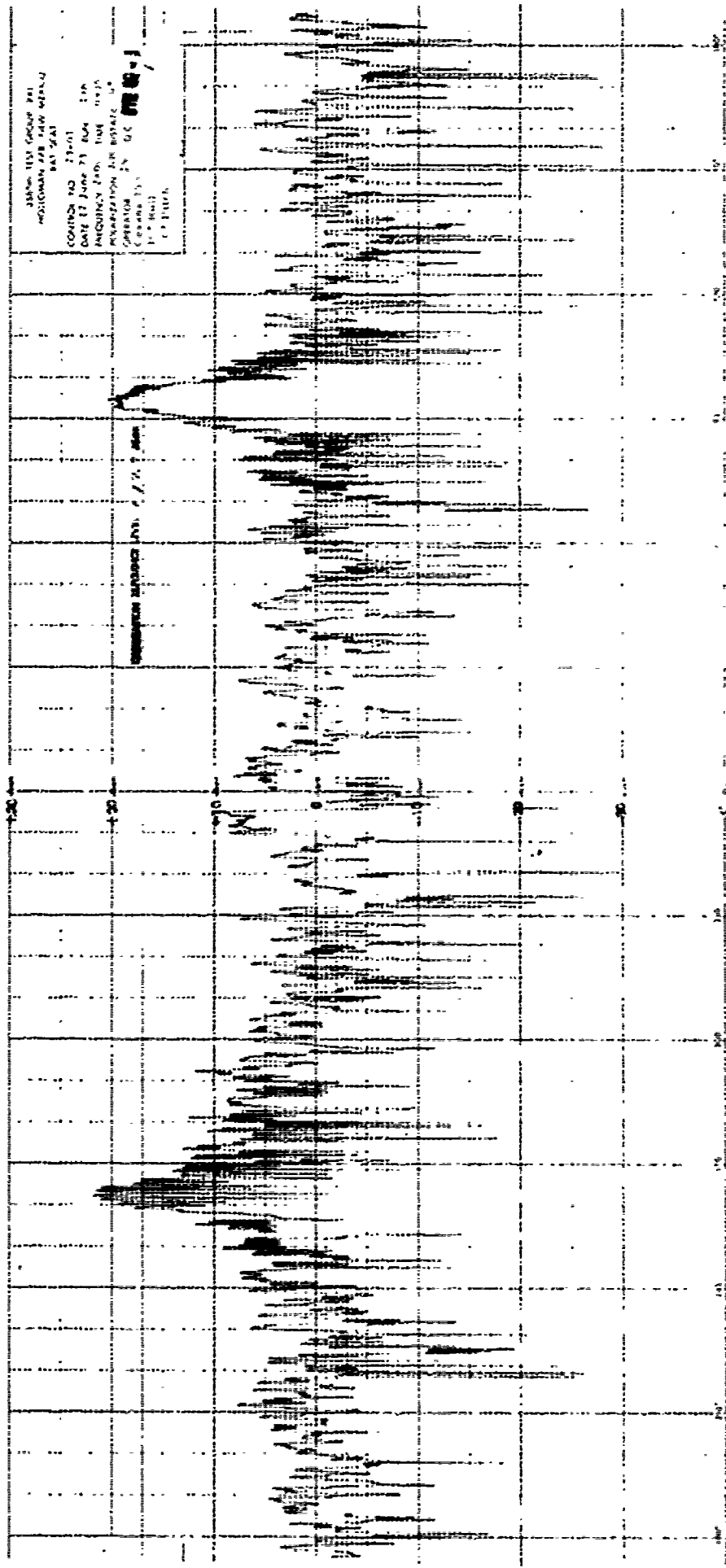
CURTAIN NO 73-01  
DATE 25 JUN 71 RUC  
INQUENCY 2400 TIME 2050  
OPERATION HH PLATONIC  
OPERATION 315 GCM 05-1  
CIRCUIT 152  
30 PAGES 150 PAGES

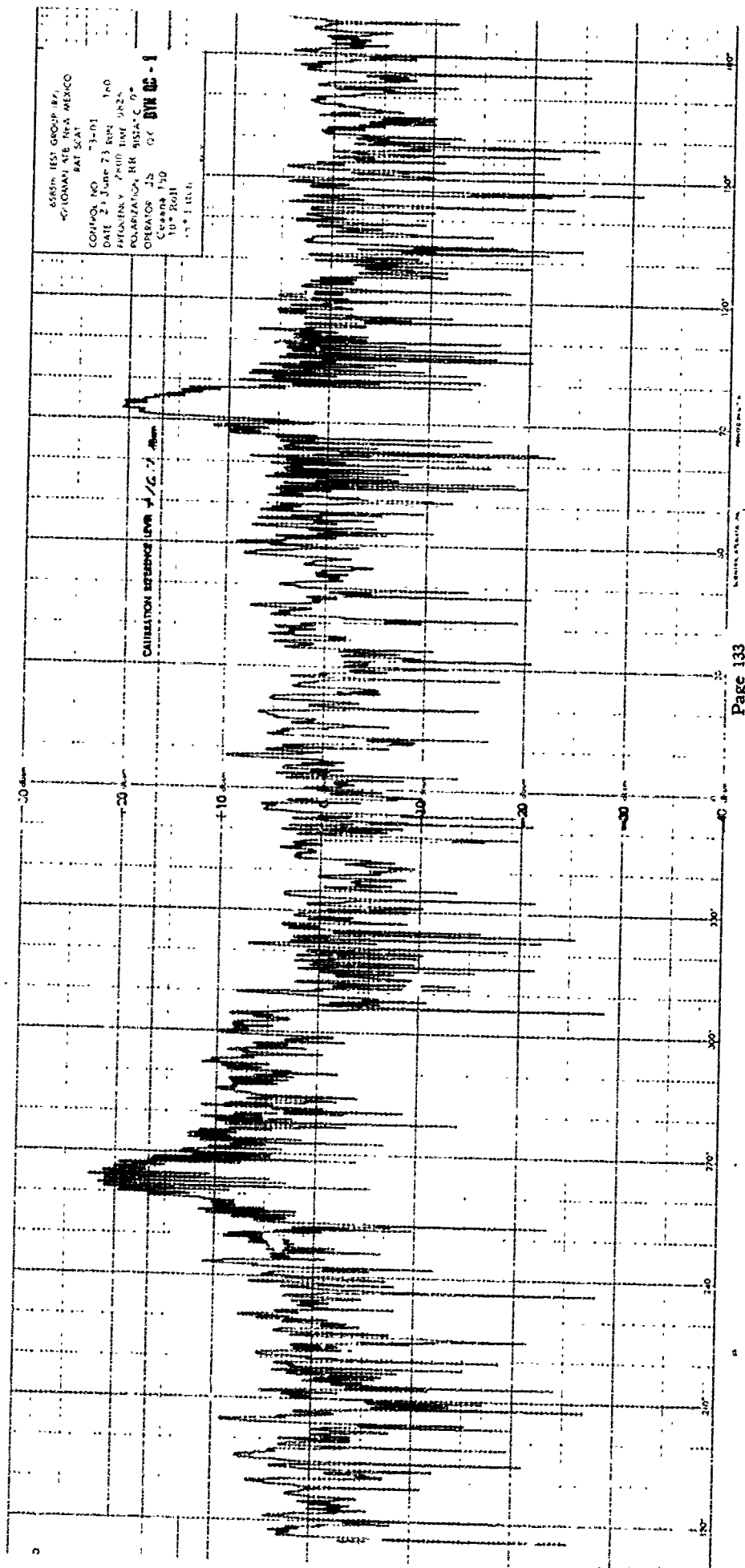
Page 1 of 1







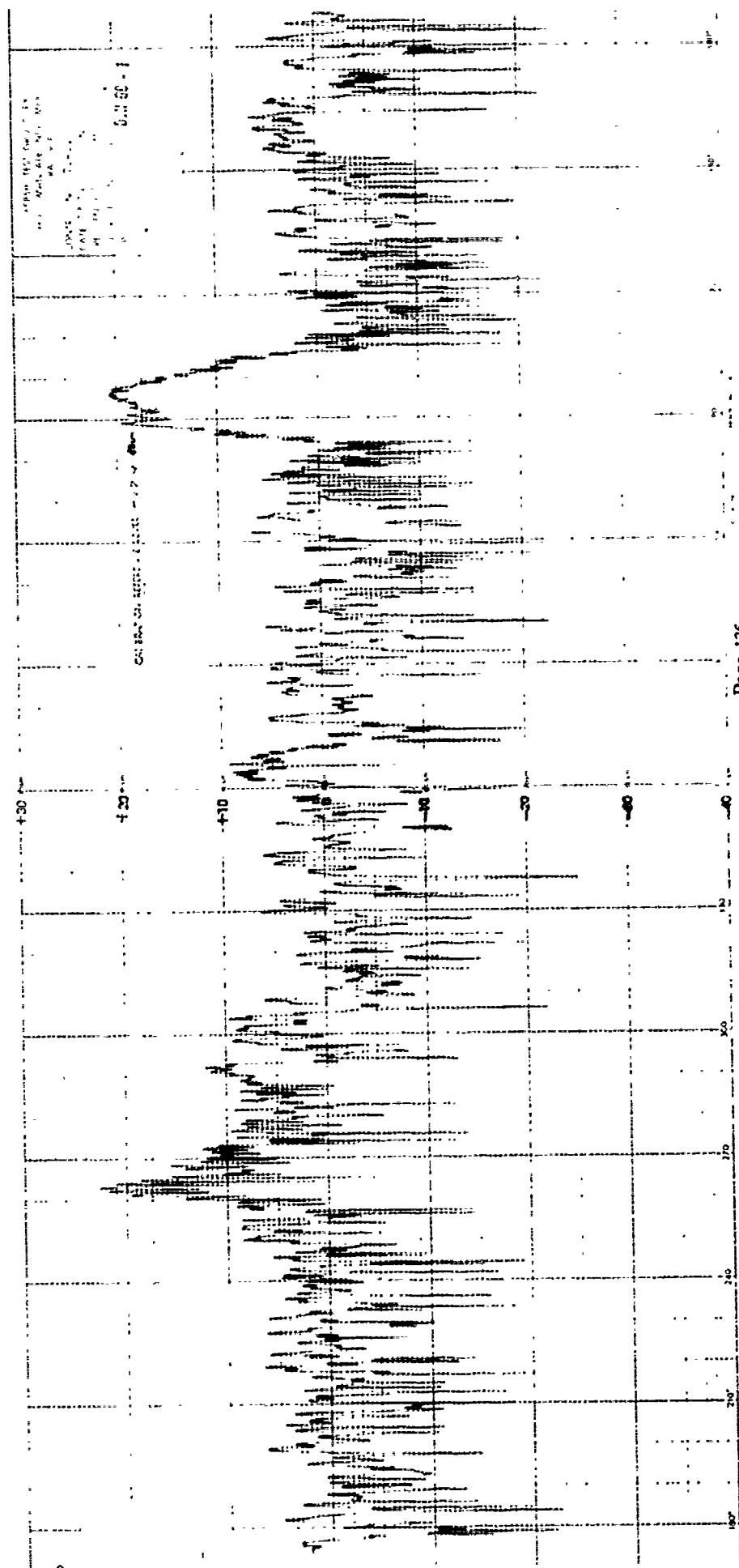














5580M 152 GROUP 371  
INDICATOR AIA NEW MEXICO  
WAT 541

CONTRAC NO. 71-01 278

DATE 11 Jul 71 004 1935

FREQUENCY 2500.000

POLARIZATION RF SYSTEM

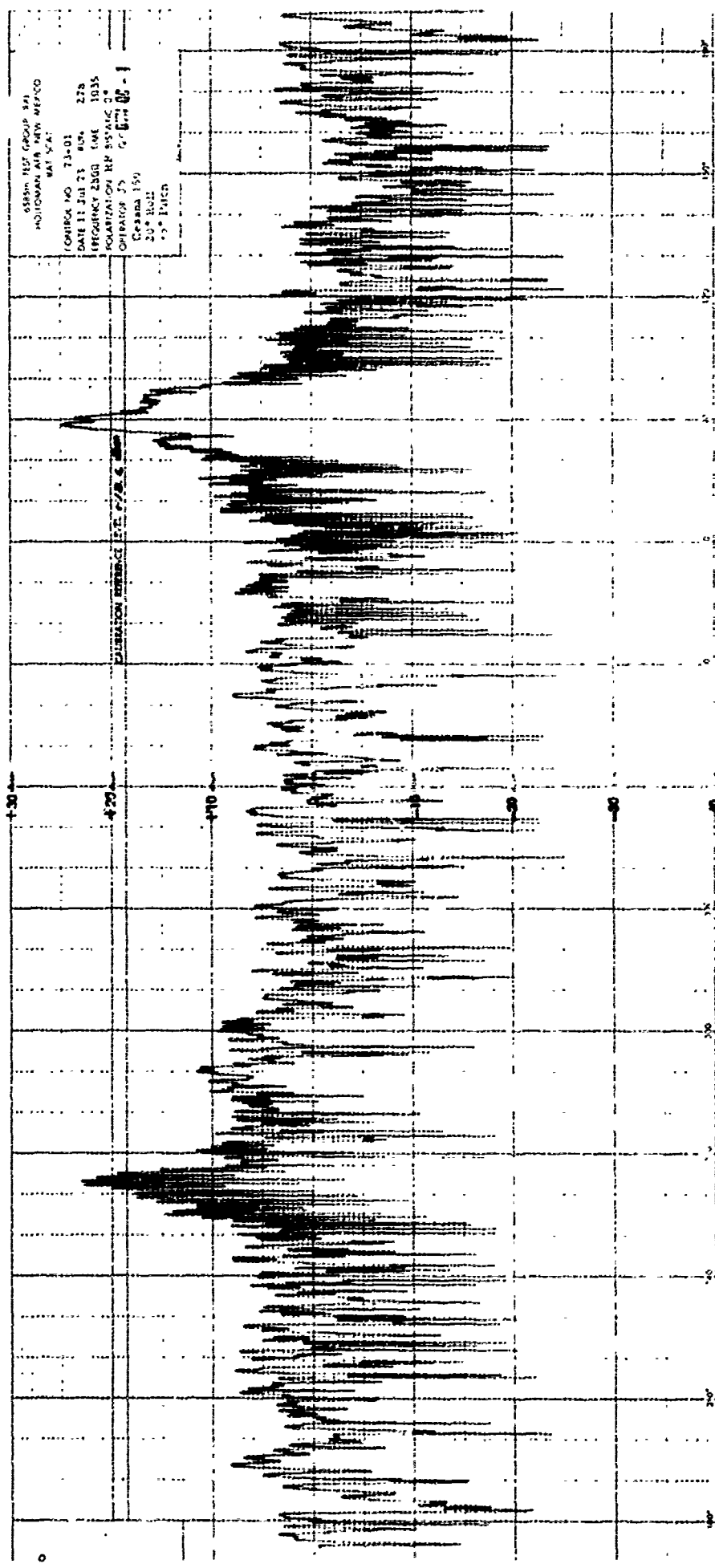
OPERATOR JS C-678 80-1

Cesana 159

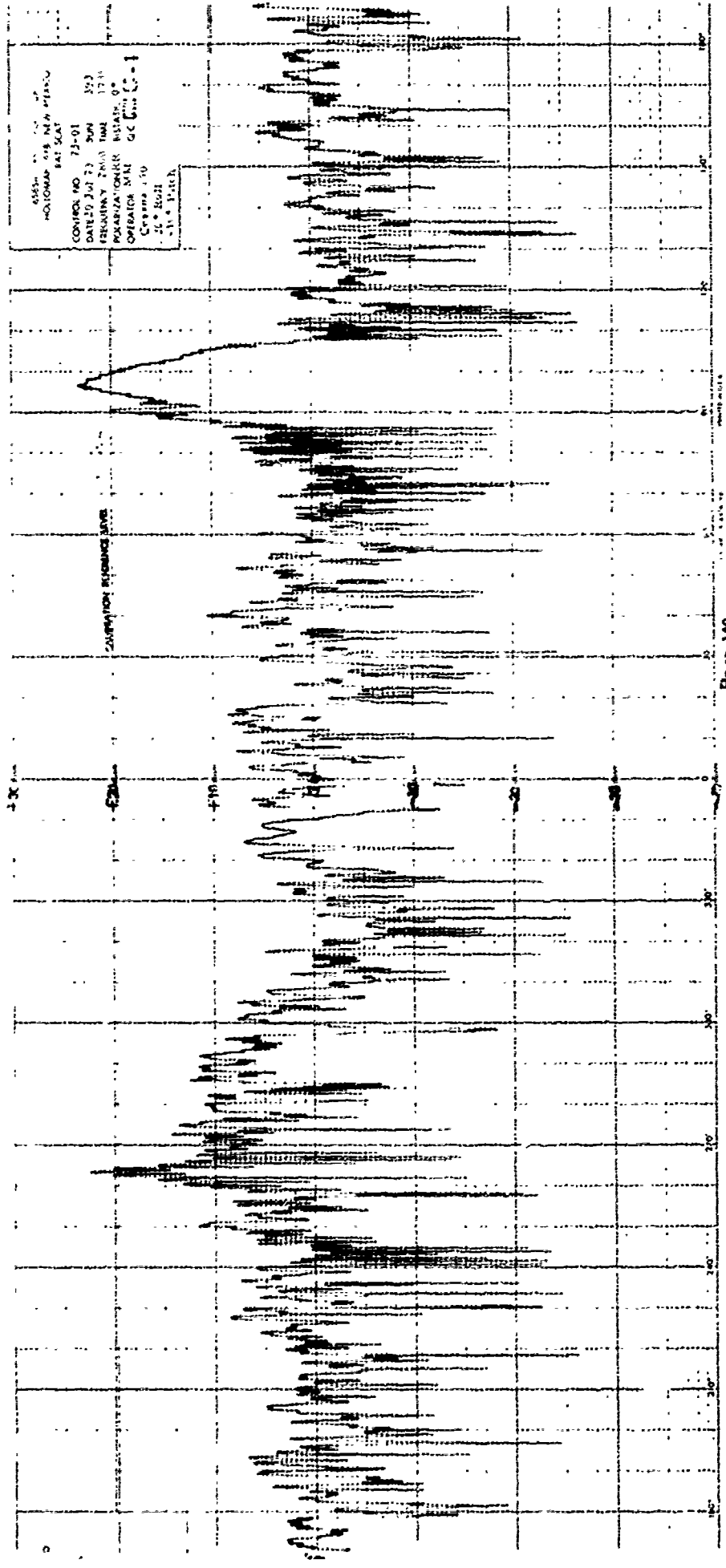
20° Roll

15° Pitch

DURATION 00:00:00

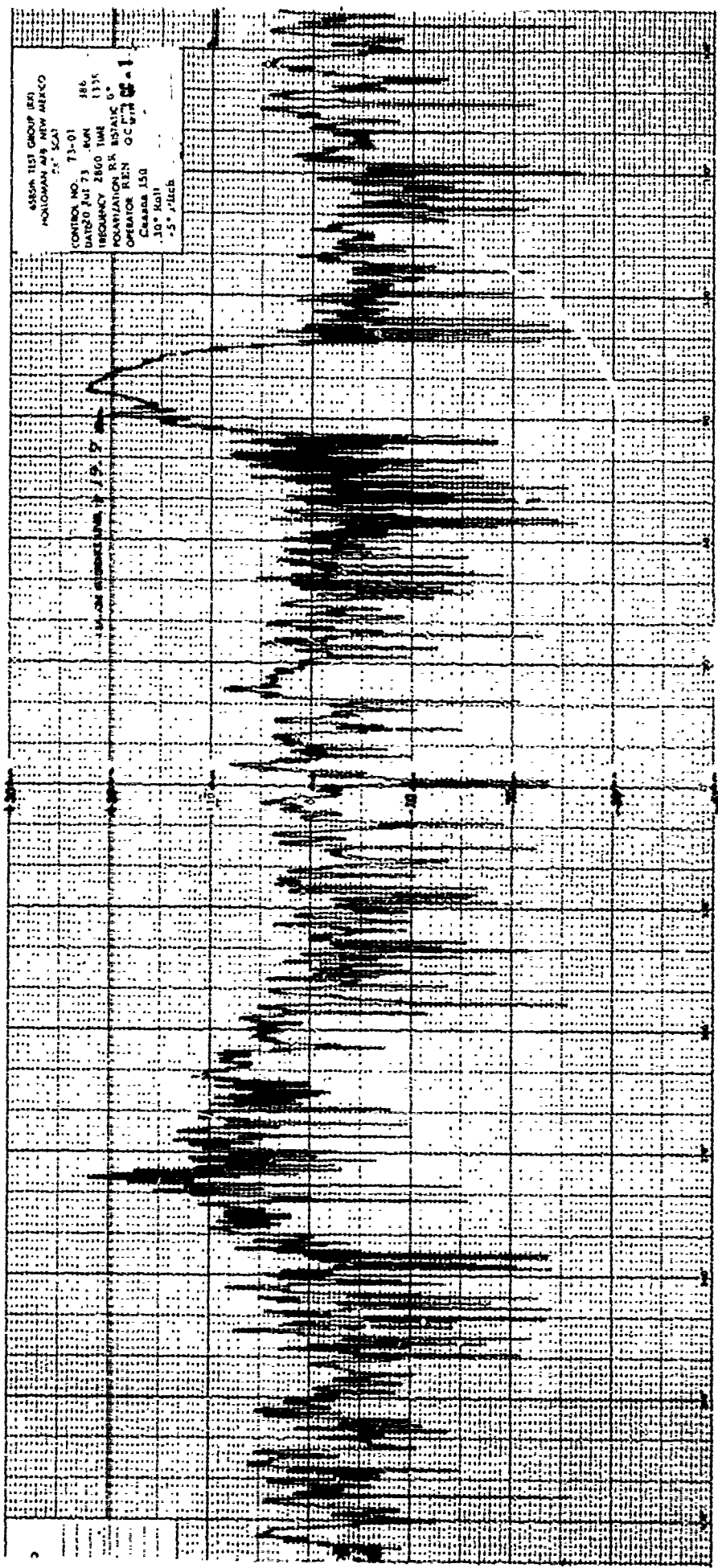






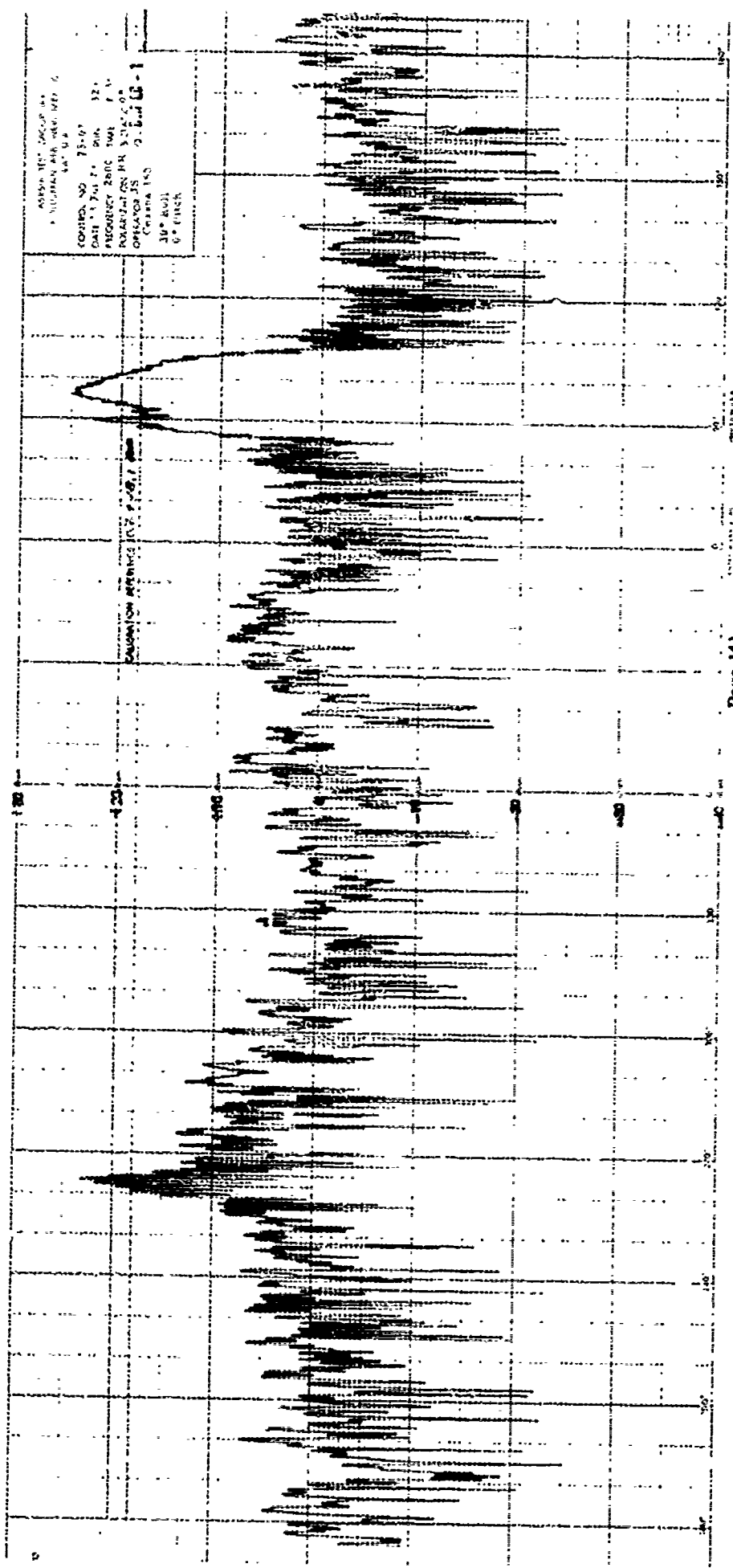
ASSN. NO. 100-100  
HOLCOMB 100-100  
SAT. SAT.  
CONTROL NO. 100-100  
DATE 100-100  
FREQUENCY 100-100  
WAVELENGTH 100-100  
OPERATOR NAME 100-100  
Crews 100  
100-100  
100-100

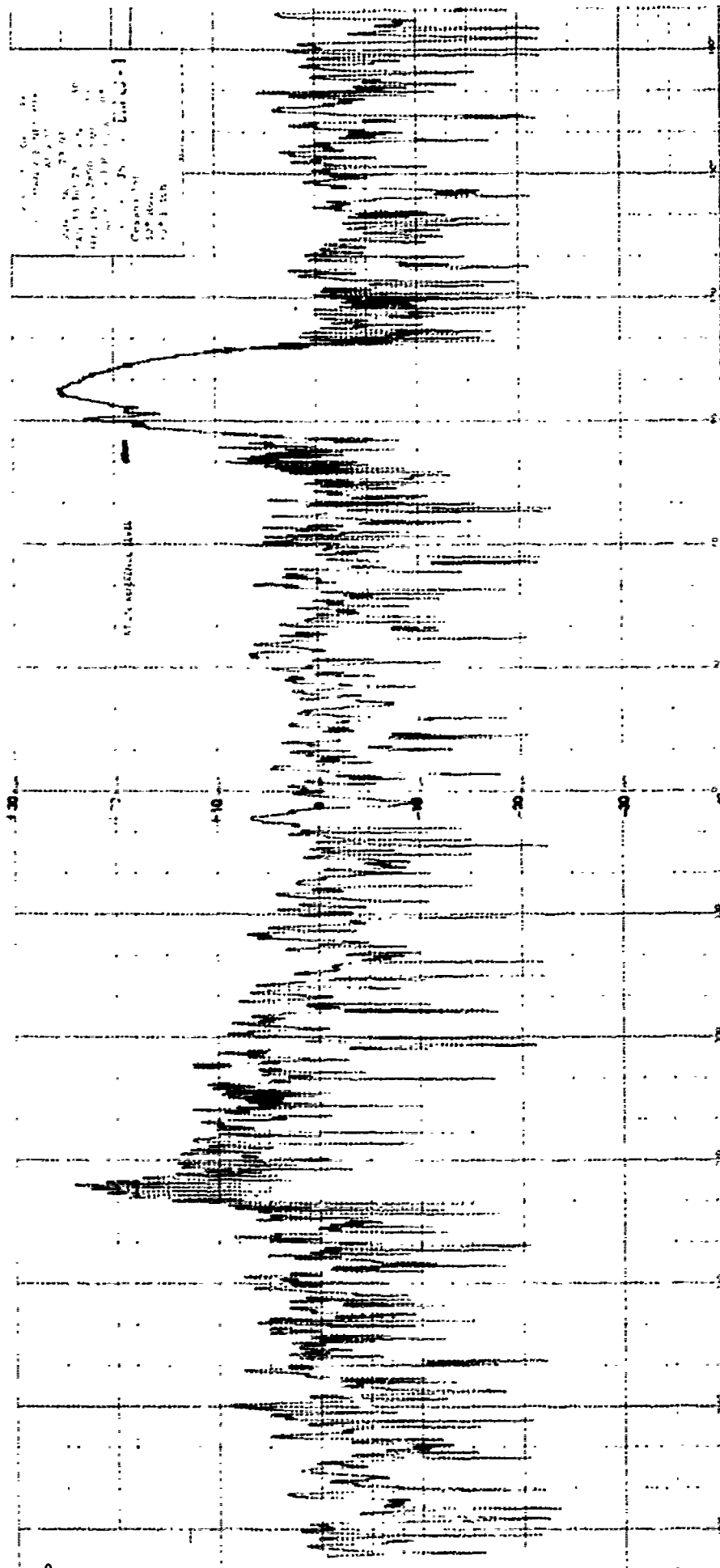
CONVECTION REFERENCE JAW



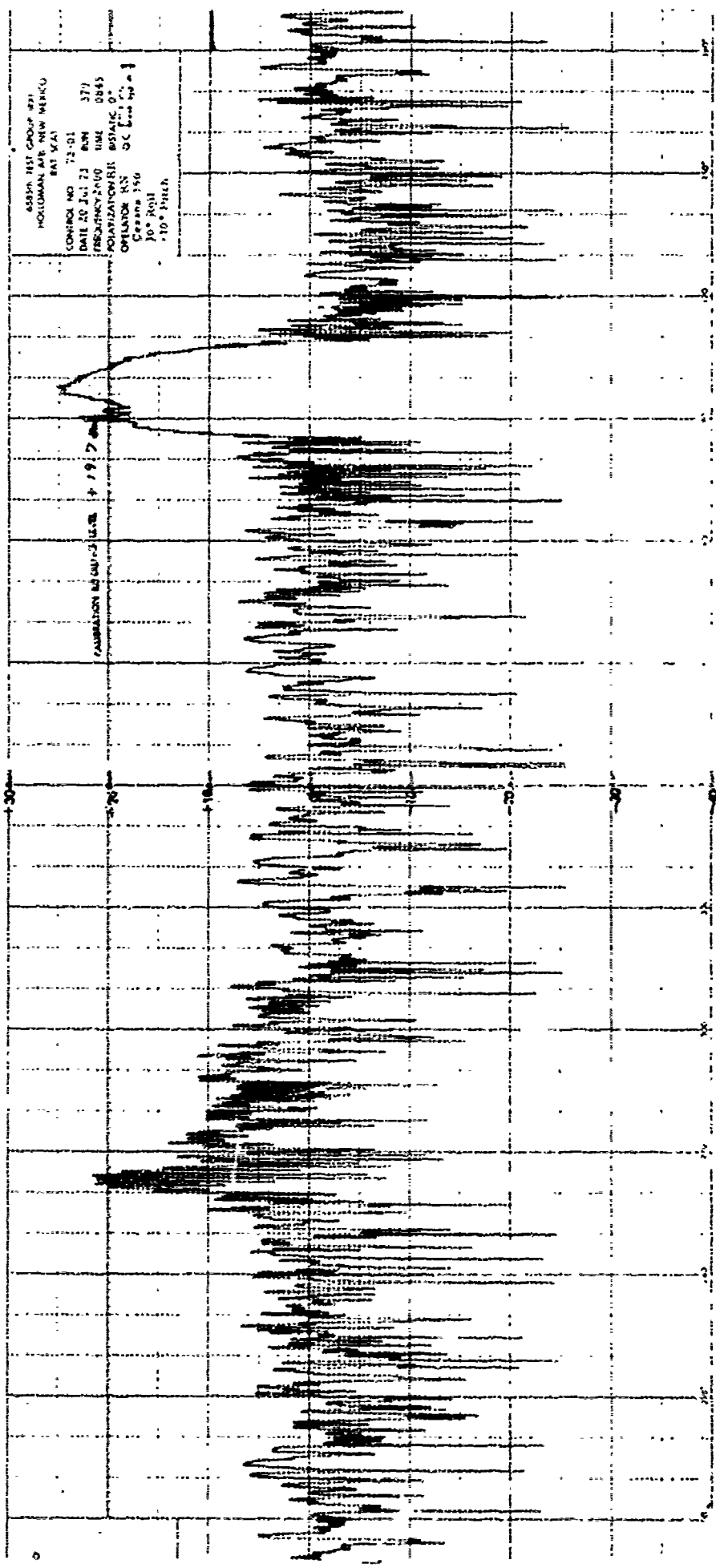
ASSON TEST GROUP (2)  
HOLLOMAN AIR NEW MEXICO  
75° 50' 15"  
CONTROL NO. 71-01 186  
DATE 0 JUL 73 RUN 1135  
FREQUENCY 2560 HZ  
POLARIZATION R.R. ESTATIC 0°  
OPERATOR R.E.N. CC 073 05-1  
Cassara 150  
10° Roll  
-5° Pitch

AIRBORNE TEST JACOUP 14  
 1 JULY 1964 AIR NEW MEY 6  
 LAT 0 0  
 COURSE NO 75-07  
 DATE 1 JUL 64 000 32  
 FREQUENCY 2000 1000 1000  
 OBSERVATION ON 10 31-12-00  
 OBSERVATION ON 10 31-12-00  
 OBSERVATION ON 10 31-12-00  
 30" ROLL  
 6" PITCH



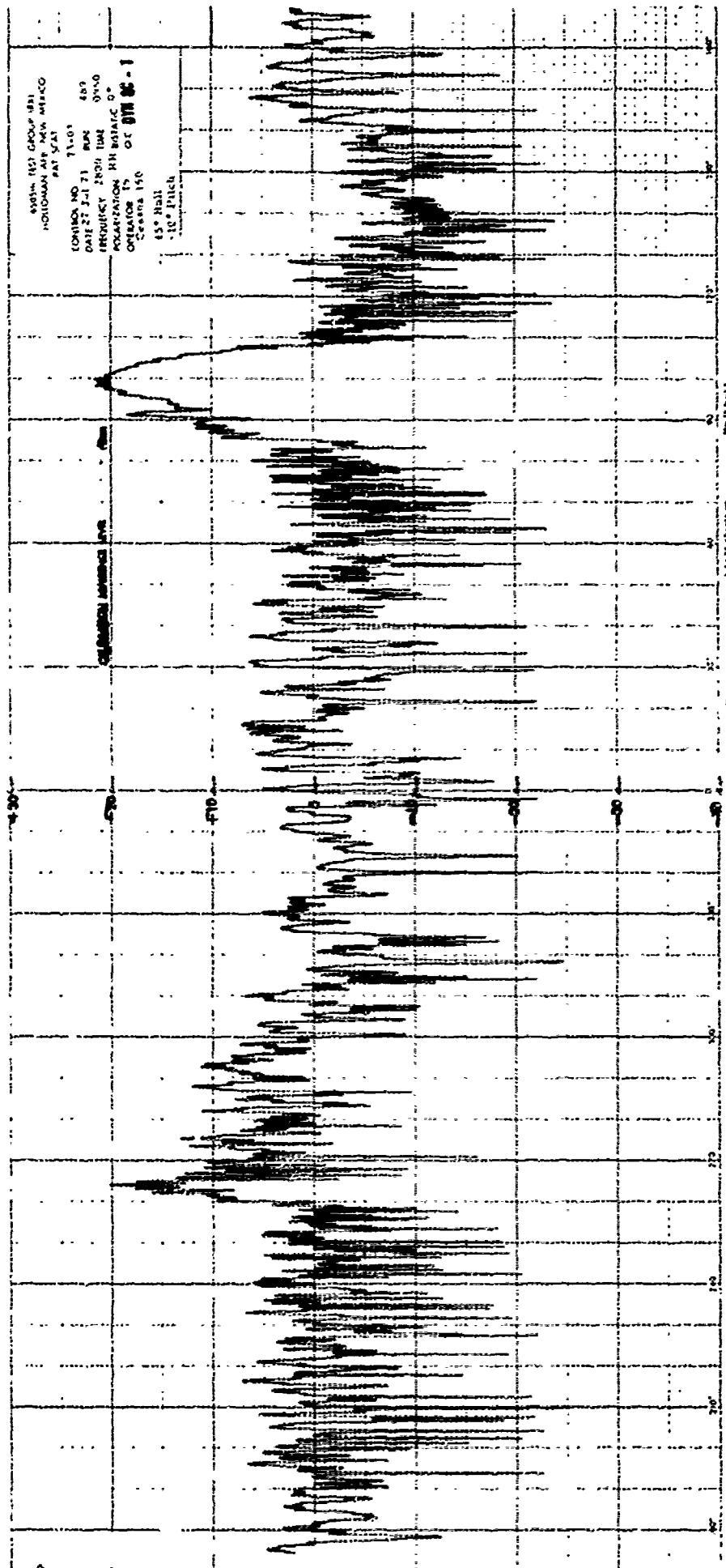


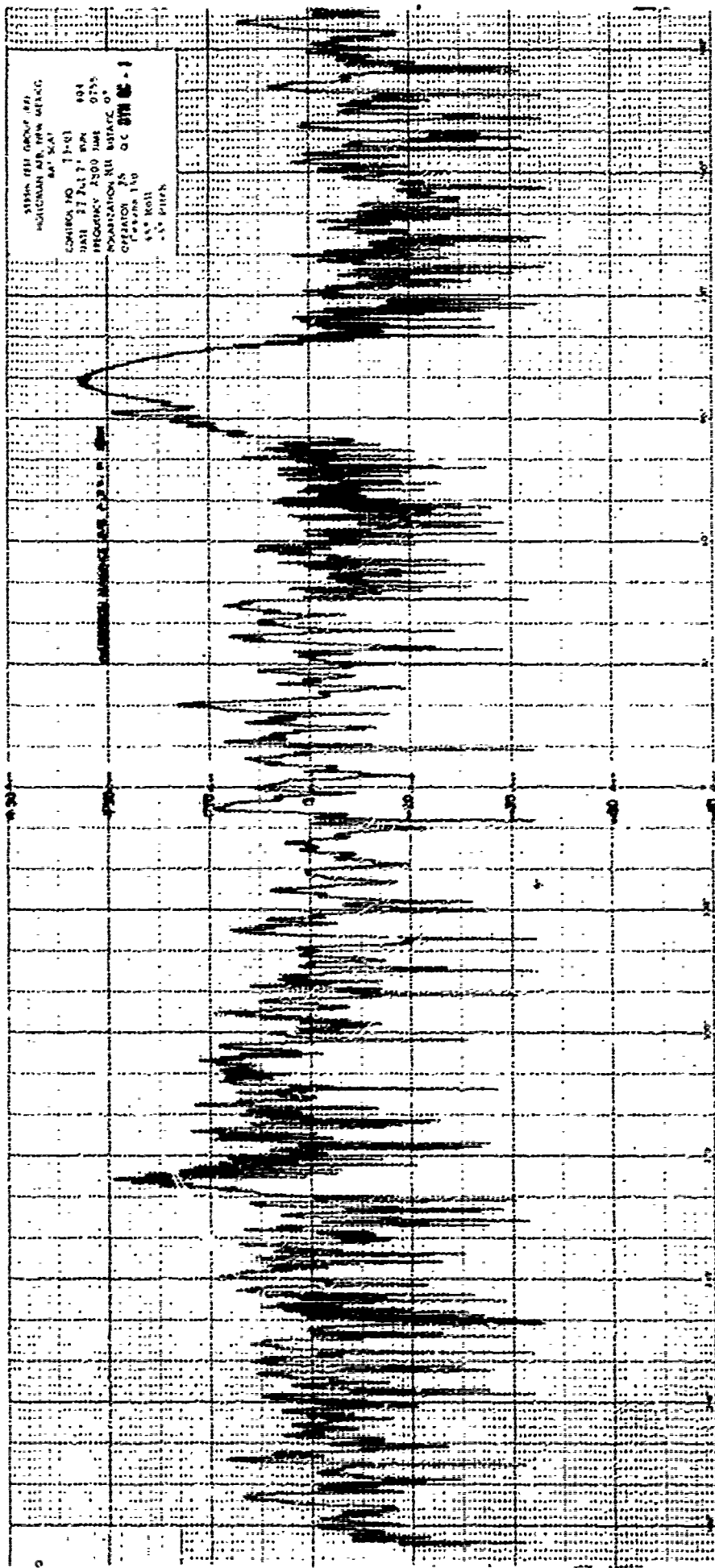


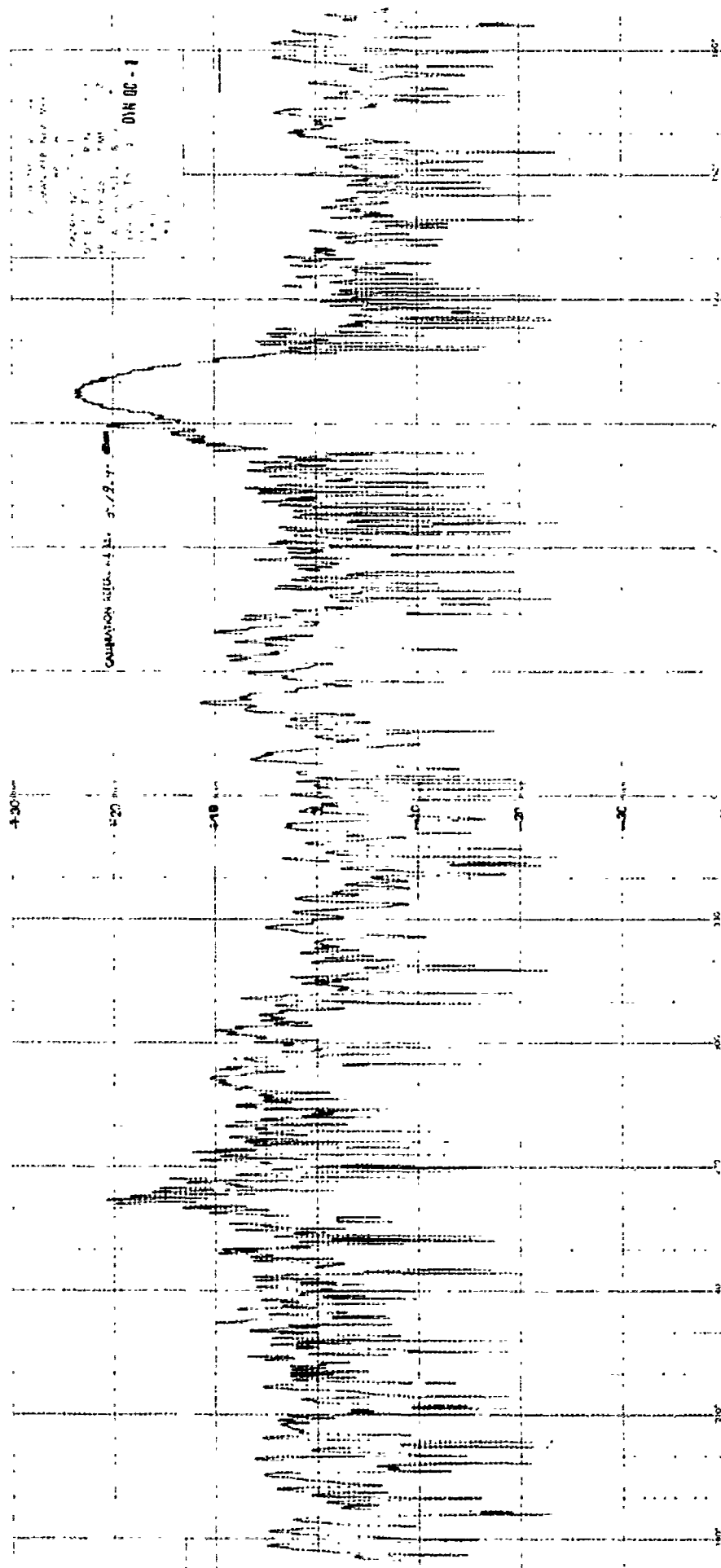


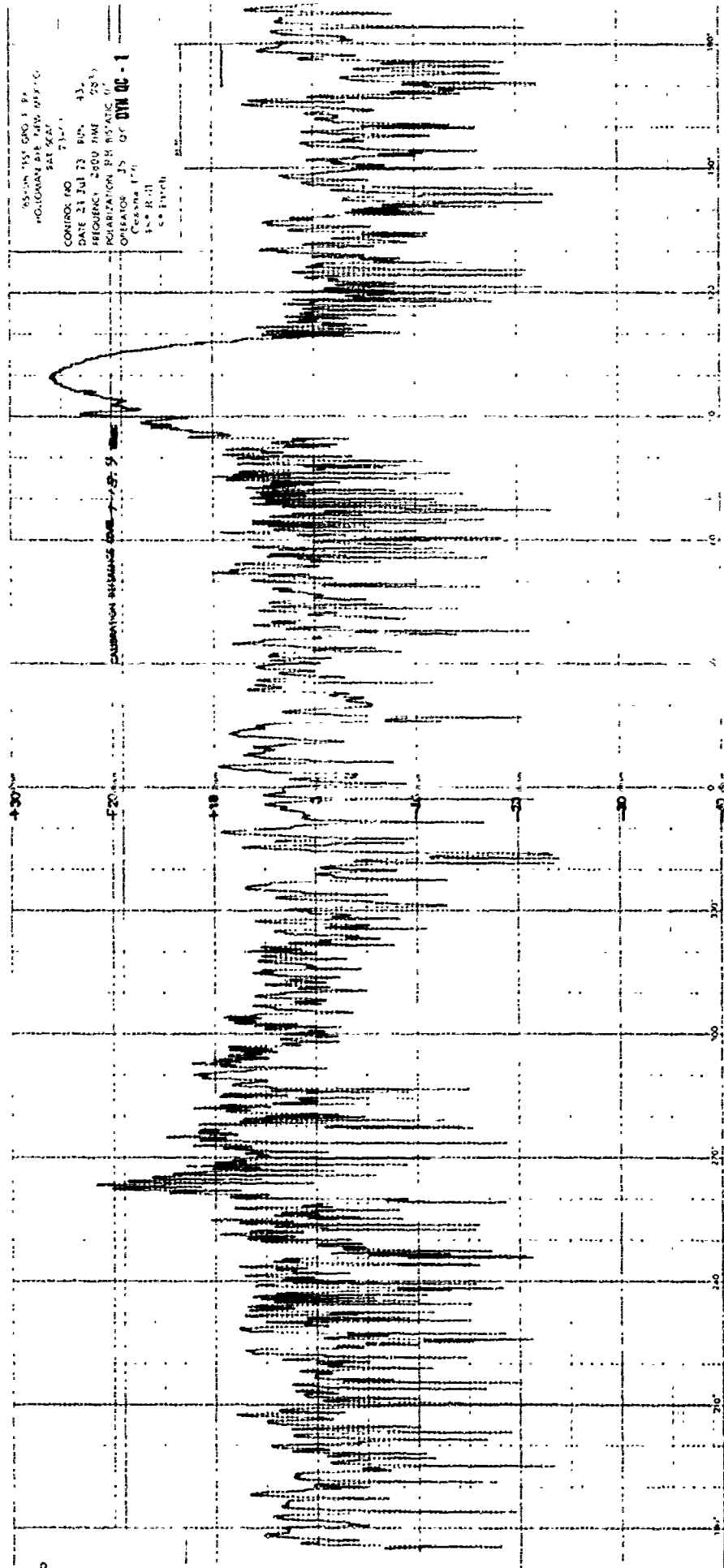
555th TEST GROUP 421  
HOLLAND AVE NEW MEXICO  
BAT WAT  
CONTROL NO 72-01  
DATE 20 Feb 73 NW 371  
FREQUENCY 2-100 HZ 0845  
POTENTIAL COEFF 150  
ORLANDO NN 50 C 100 100  
CROSS 150  
10" PULS  
110" PULS

1977

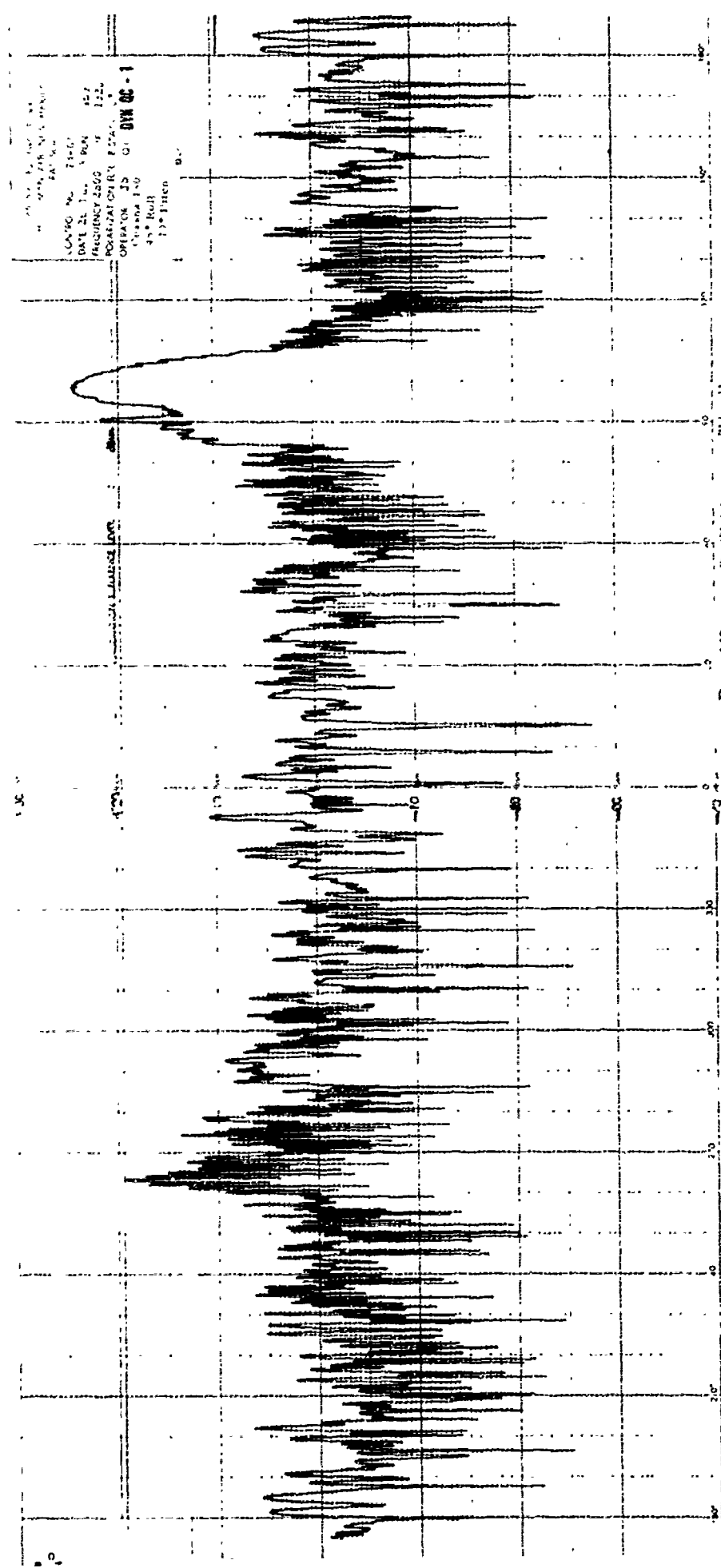








55-101 751 000 1 1 1  
#0.000000 0.000000 0.000000  
DATE 21 JUL 73 00:00 43  
FREQUENCY 2000 HZ 28.5  
REGULATOR 0.000000 0.000000  
OPERATOR 15 00 000 00 - 1  
Cassidy 171  
1-0 R 11  
1-0 R 11



Page 149

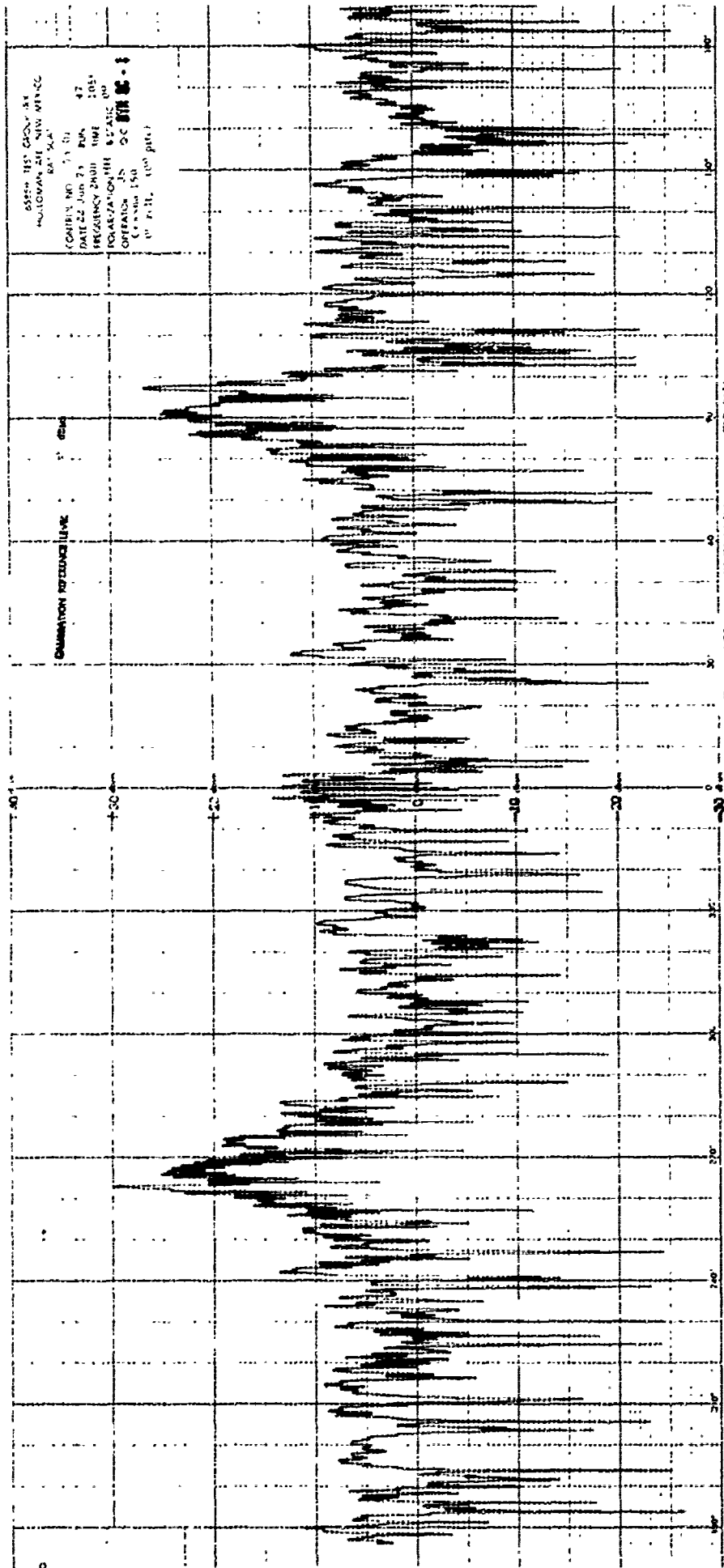
DATE 12-1-68  
TIME 10:00  
LAT 30  
LONG 100  
FREQUENCY 2500  
POWER 100  
OPERATOR J. J. JEN  
STATION 100  
10-11-68



65814 100 100 1 18  
 HOLLANDMAN, AR. REG. MEXICO  
 PAT. 524  
 CONTROL NO. 73-01  
 DATE: Aug 73 PM 12:1  
 FREQUENCY 20.00 MHz 1740  
 POLARIZATION PM 85.0%  
 OPERATOR JMM 0.00  
 INVESTIGATED WITH 4" POLI.  
 - 10" 2 inch Transitions







6585th TEST GROUP (TA)  
HOLCOMAN AFB NEW MEXICO  
BAT 54-1

CONTROL NO 73-01  
DATE 21 Jun 73 RUN 2R  
FREQUENCY 2600 MHz 1545  
POLARIZATION (H) BISTATIC  
OPERATOR NNN GT 54-15-1

150  
000 Full, -50 pitch

Distances in meters from 0 to 1000

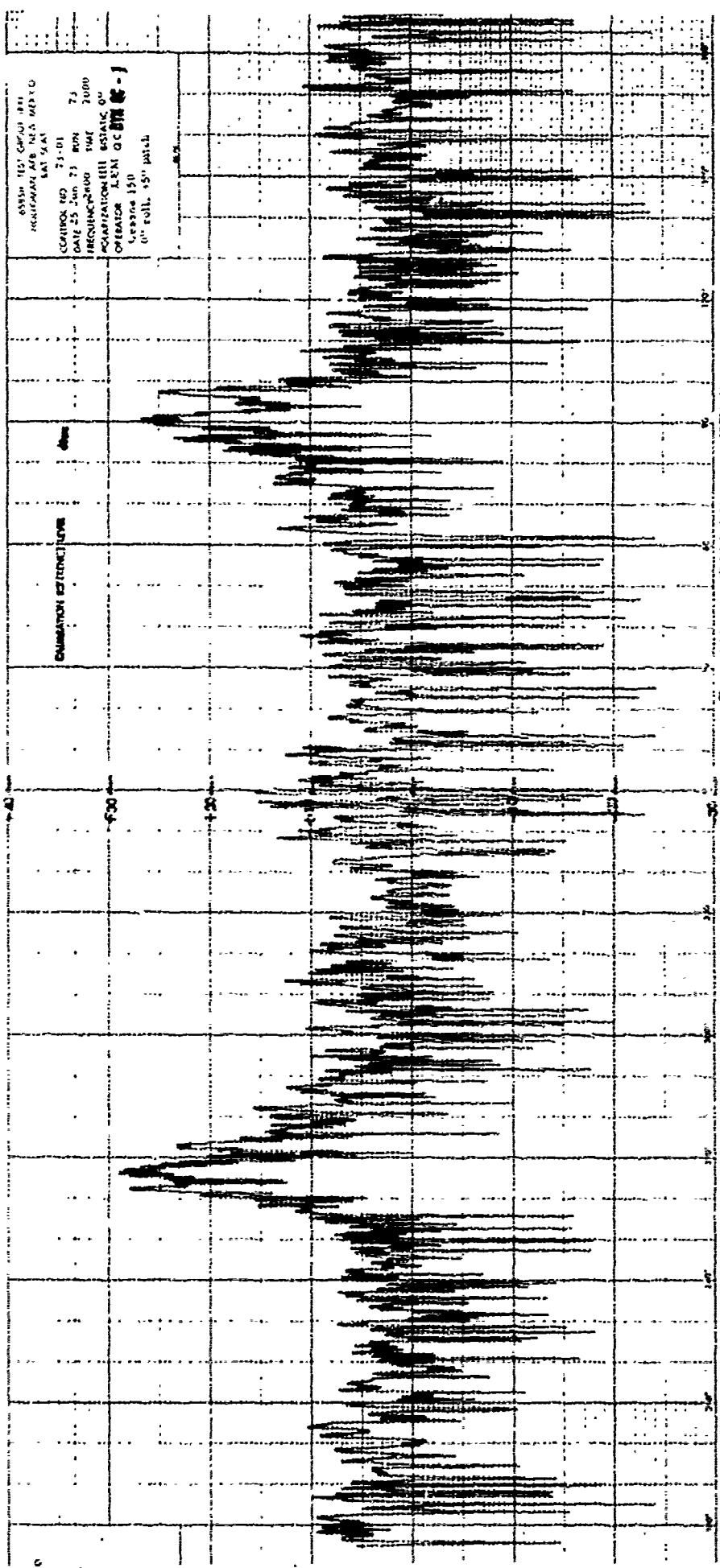
6585th TEST GROUP (TA)  
HOLCOMAN AFB NEW MEXICO  
BAT 54-1

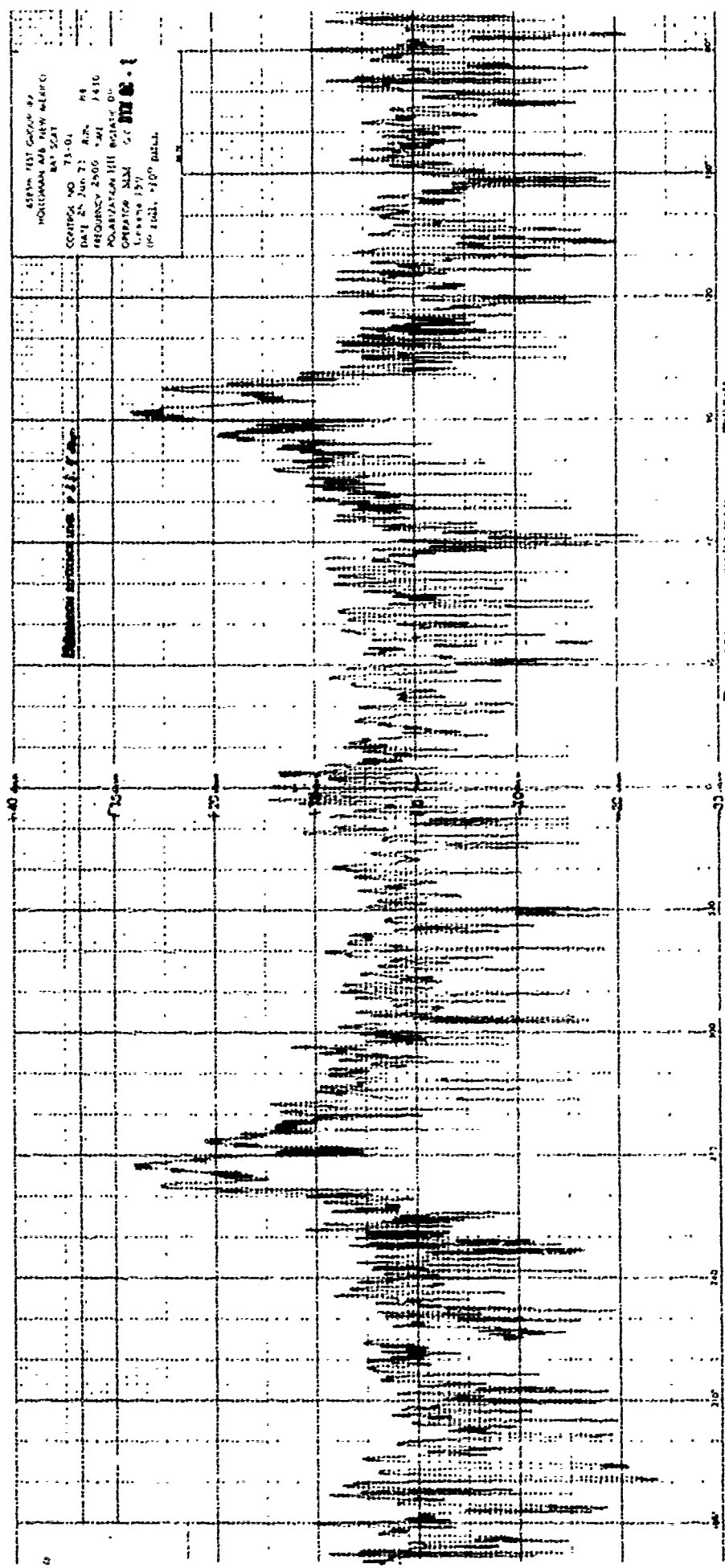
CONTROL NO 73-01  
DATE 21 Jun 73 RUN 2R  
FREQUENCY 2600 MHz 1545  
POLARIZATION (H) BISTATIC  
OPERATOR NNN GT 54-15-1

150  
000 Full, -50 pitch

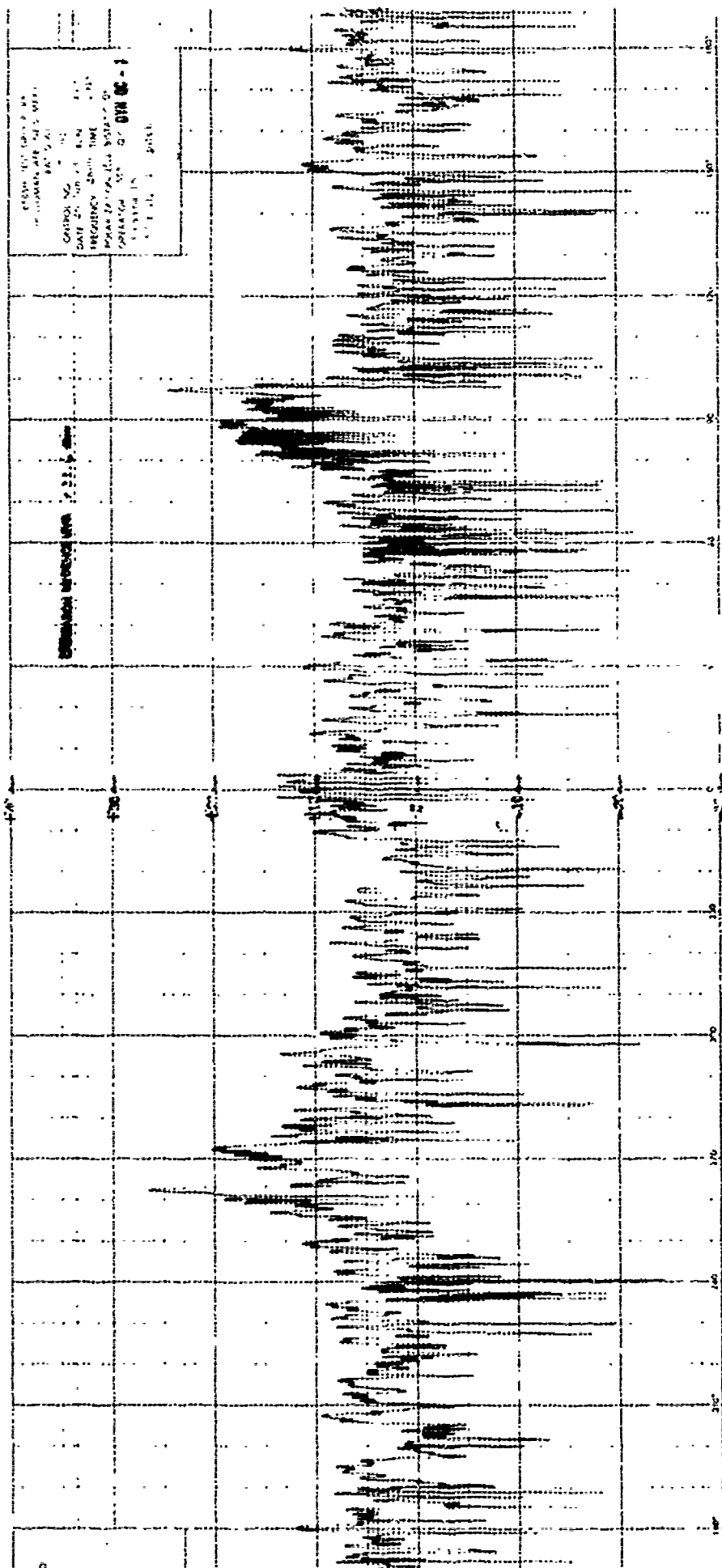
Distances in meters from 0 to 1000



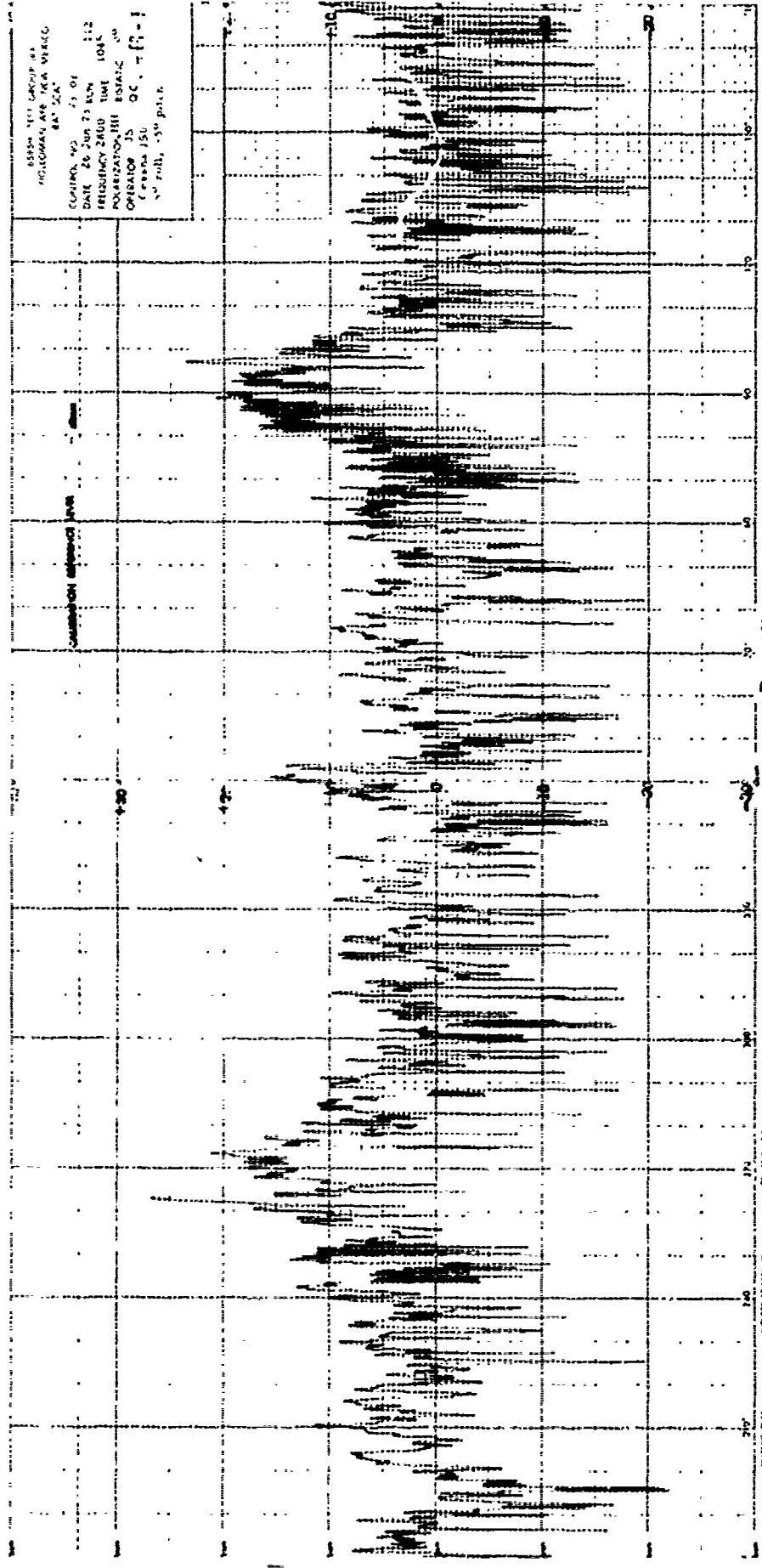




SYSTEM TEST GROUP #2  
HOLCOMB AFB NEW MEXICO  
RAY SCAT  
CONTROLLER NO 73-01  
DATE 24 Jun 73 RUN #8  
FREQUENCY 2500 MHz F810  
POLARIZATION III ROTARY ON  
OPERATOR NMM C.C. 010 00-1  
LAWRENCE 1977  
00 1043.1100 BULL



6350M 101 GROUP 13  
 HOLLOWAY, ARK. 101A W180  
 44° 50' N  
 DATE 26 JUN 73 04 112  
 FREQUENCY 2400 TWT 1045  
 POLARIZATION III E3042C 00  
 OPERATOR JS QC 17-1  
 (Pena 150) 50 roll, 50 pitch

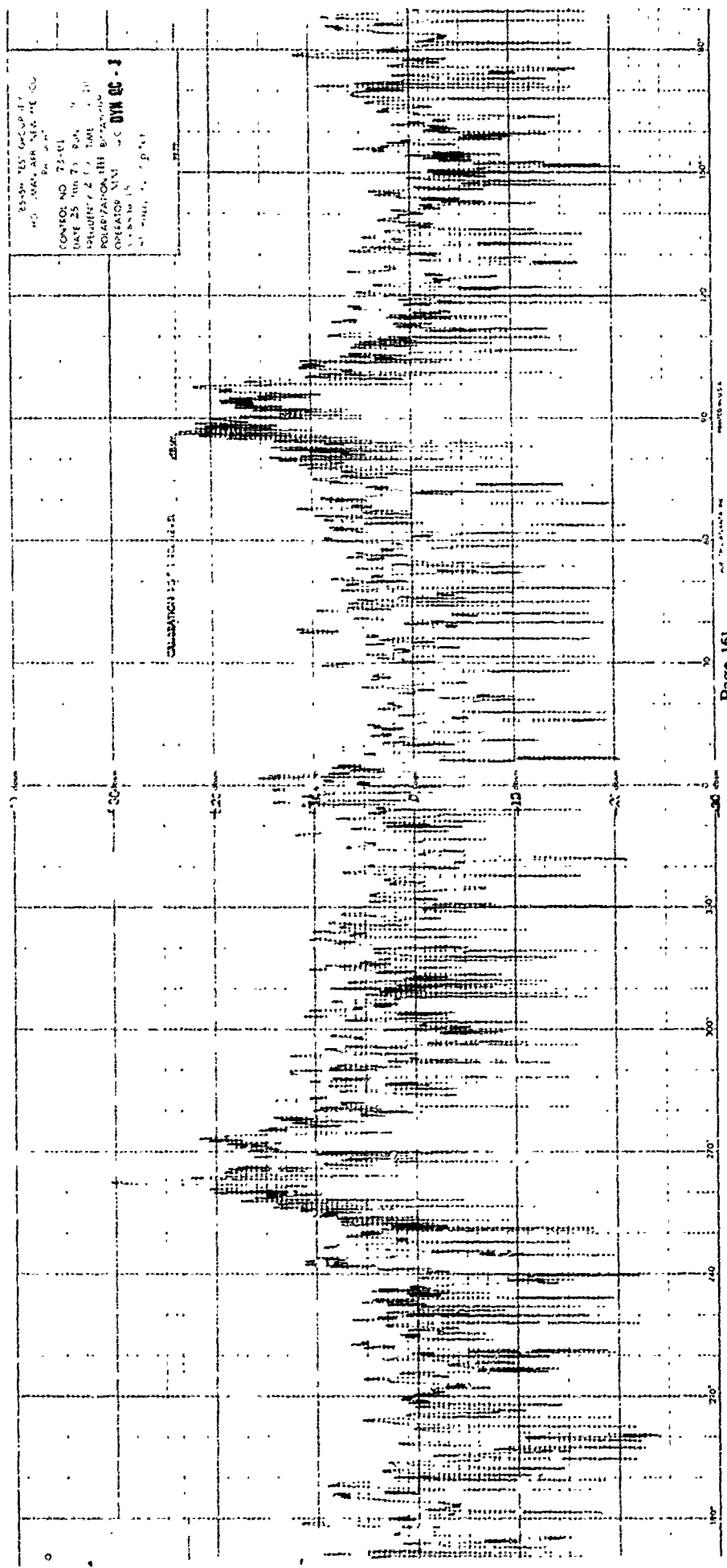






ASST. TST. COMPT. 22  
MULTIMAN. AIR TREN. REPTED  
SAT 16.41  
COMPTON NO. 71.01  
DATE 25.10.75  
PROCESSED 2300 TME  
NO. 100  
OPERATION 1000  
CLASS 130  
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COMPTON NO. 71.01





ASST. TEST GROUP BY  
HOLDMAN, A. B. NEW MEXICO

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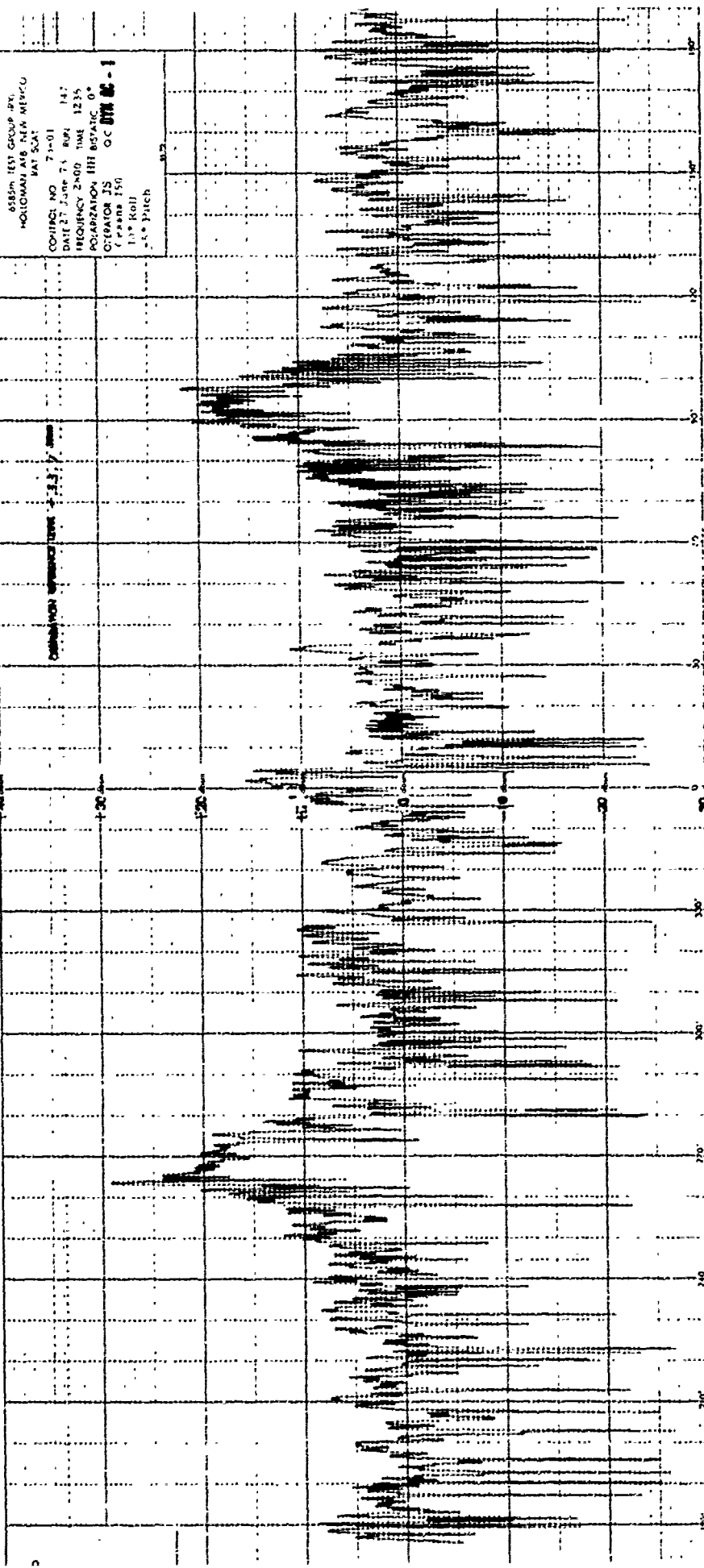
TIME

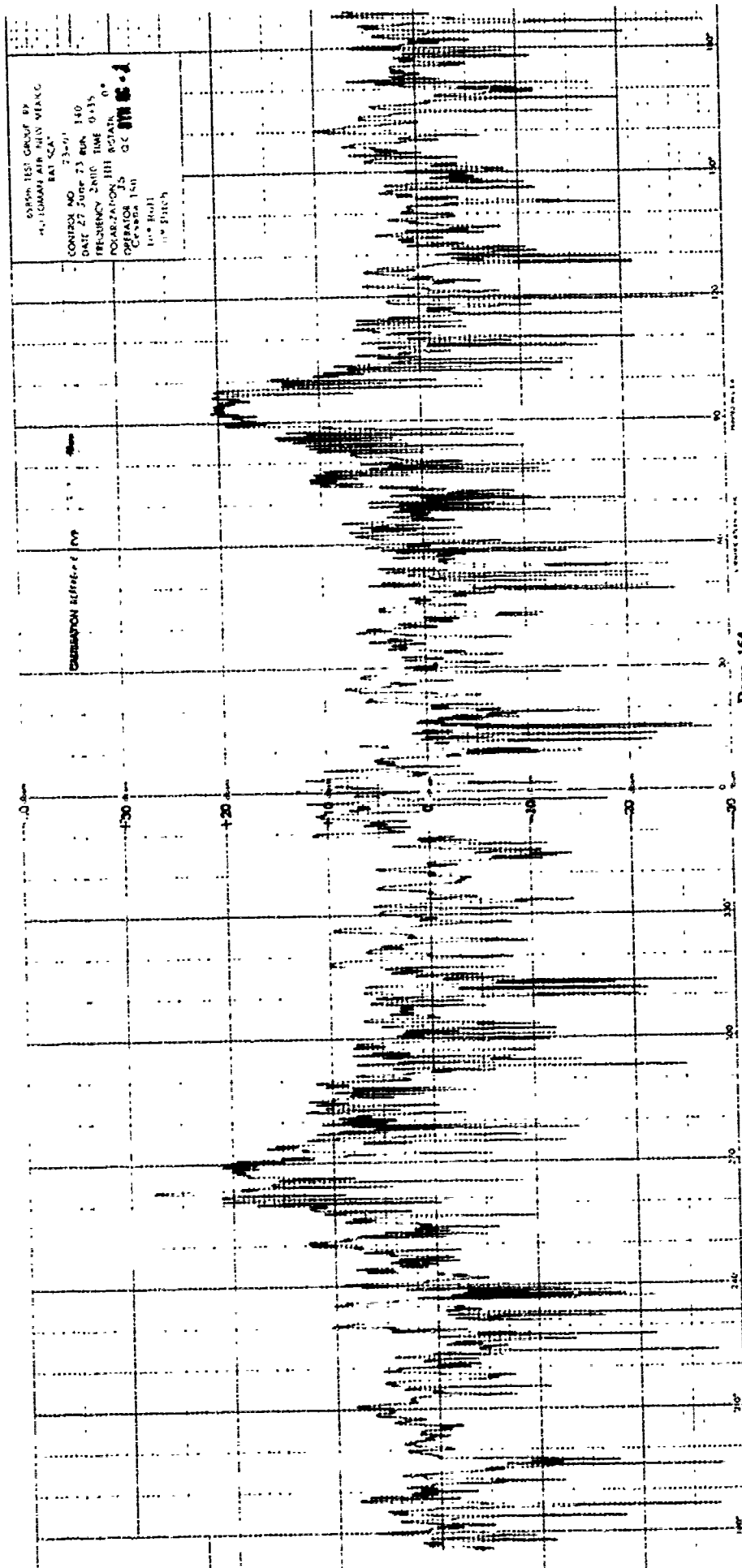
TIME

TIME

TIME

DATE 7-1-01  
TIME 14:27  
FREQUENCY 2000  
HMI BISTATIC 01  
OPERATOR JS  
Cass 150  
1st Roll  
2nd Pitch



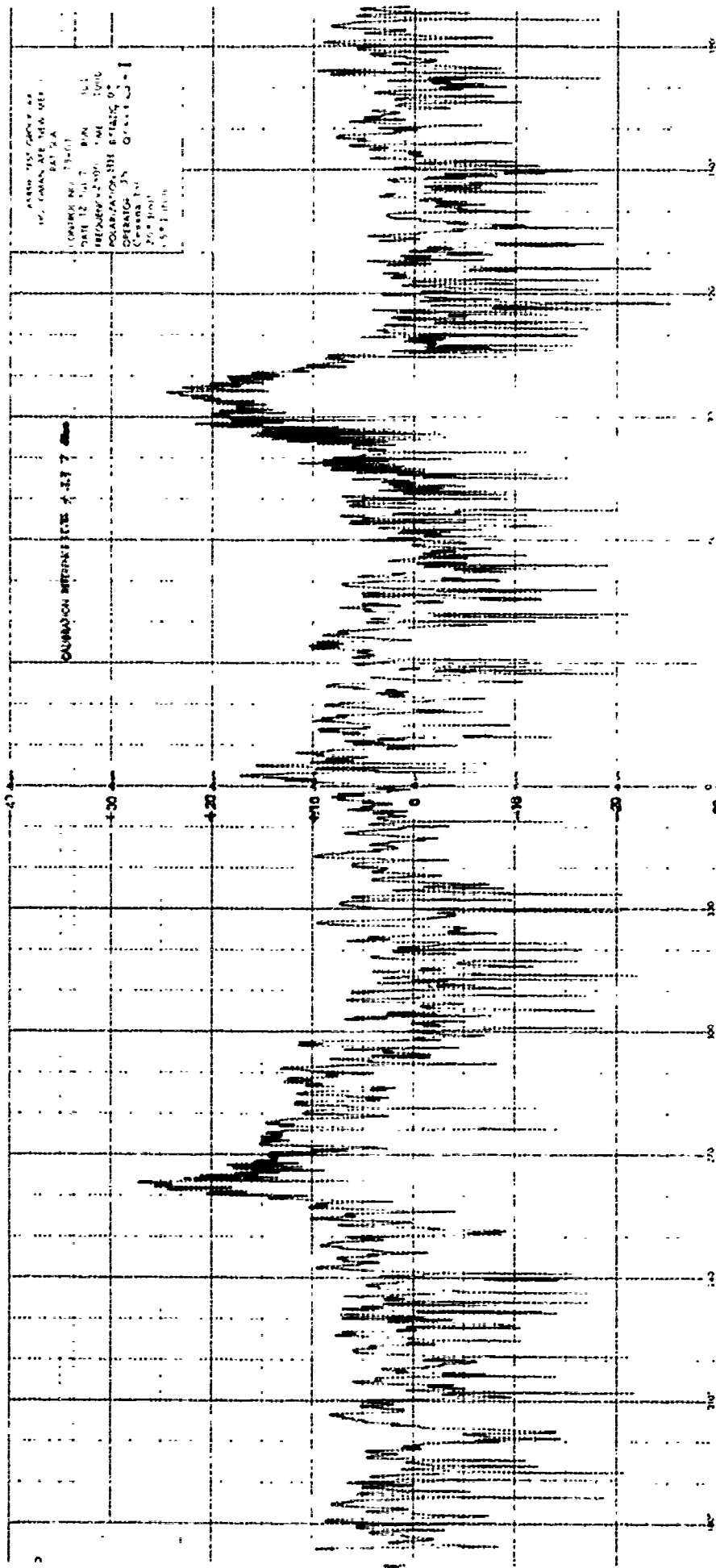




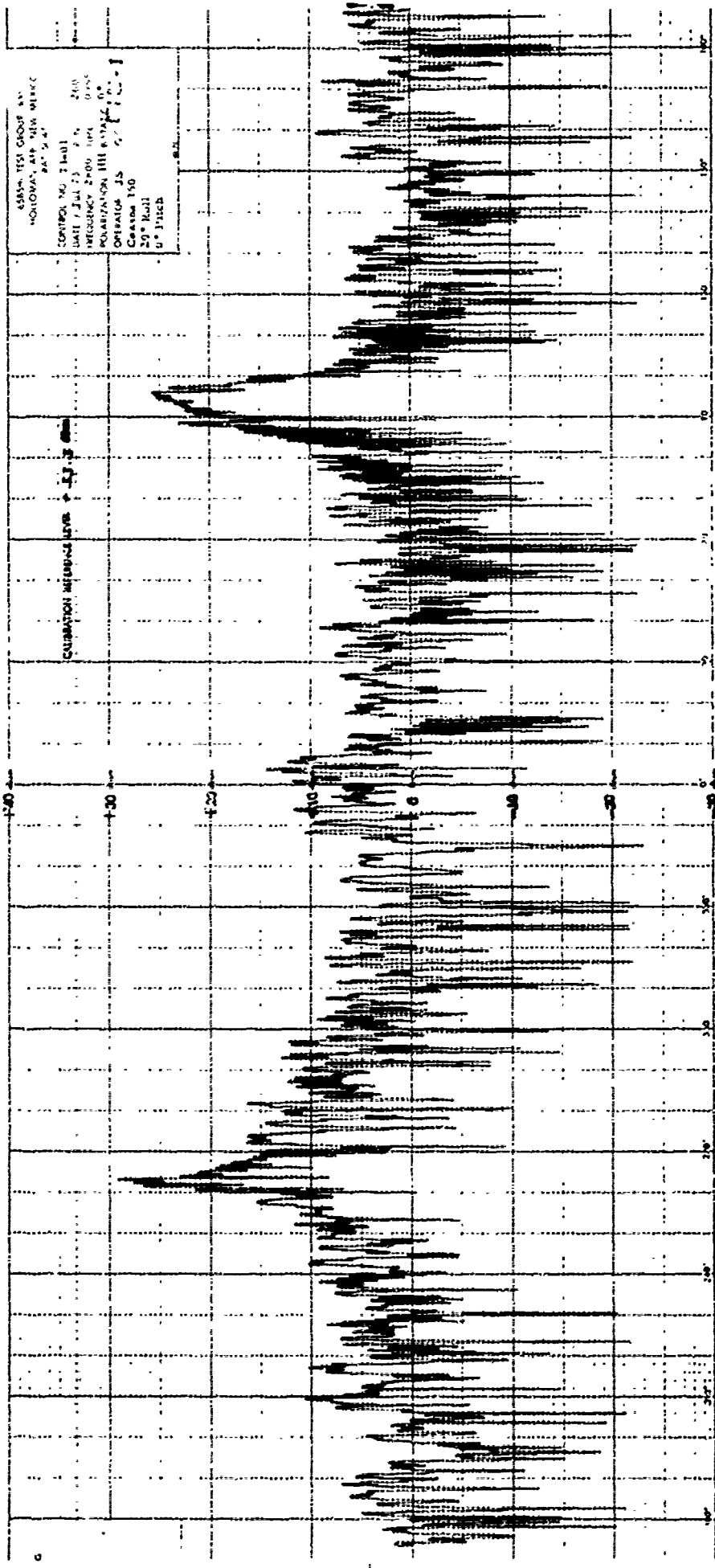




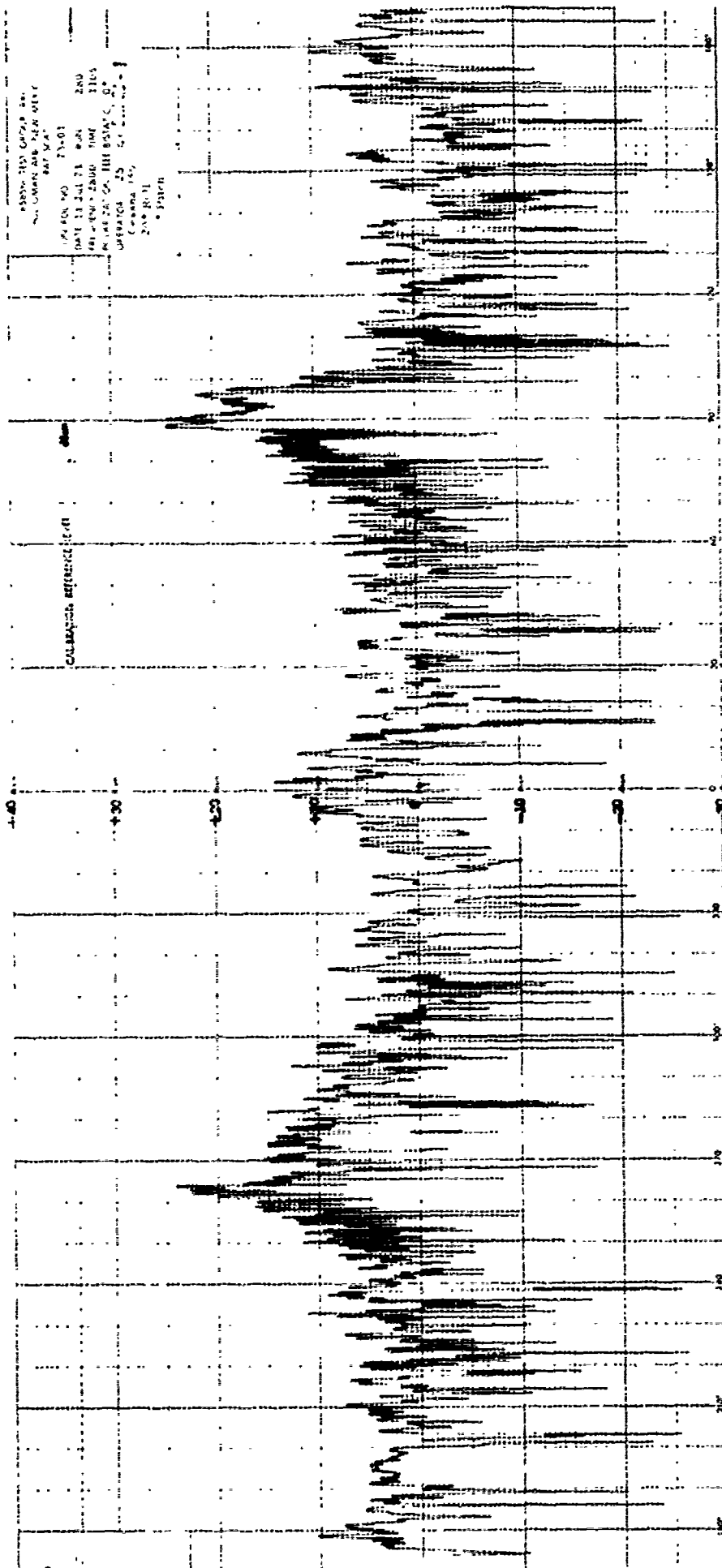


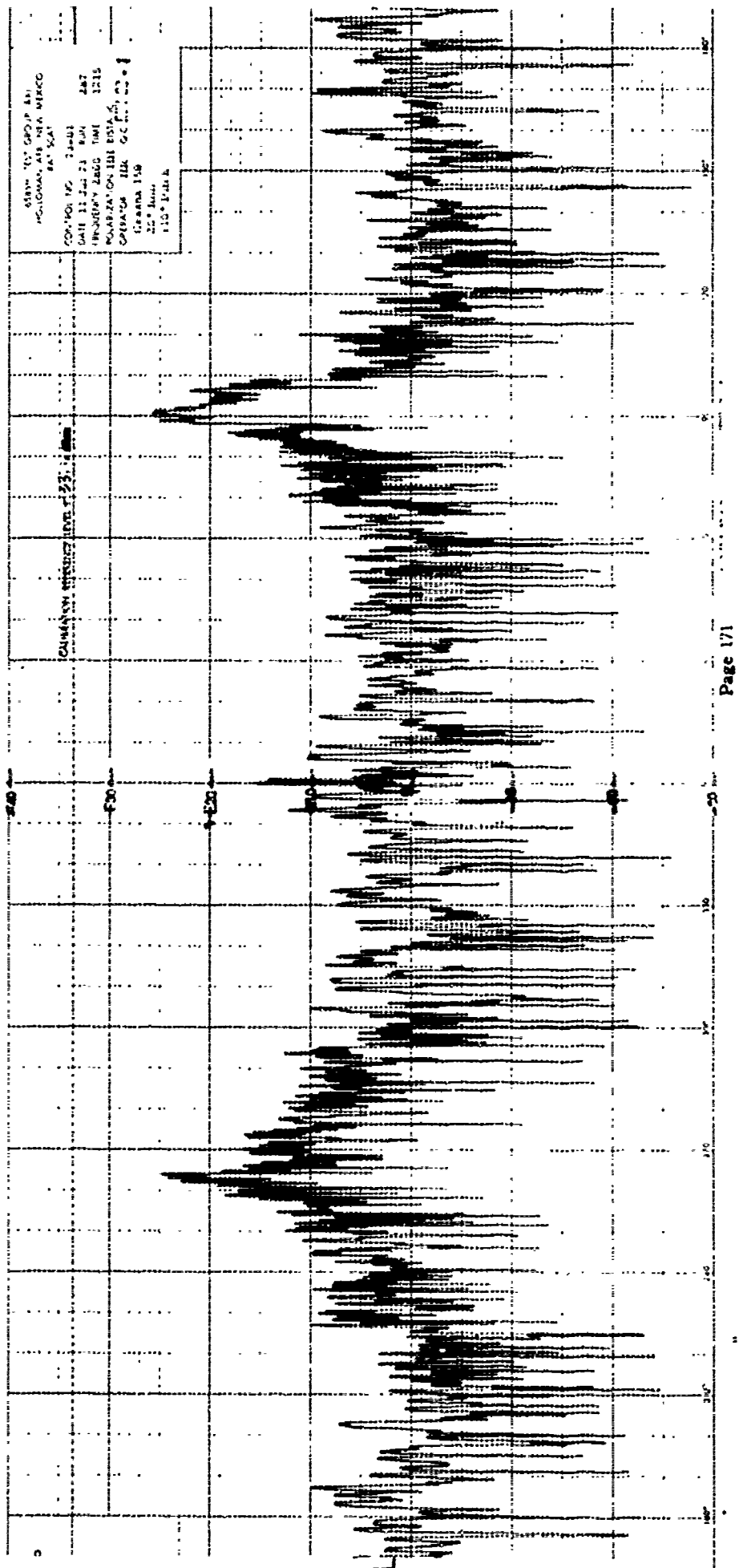


AREA 155 0000 00  
 100.0000 0000 0000  
 DATE 12 10 7 0000 0000  
 REFERENCE 2000 0000 0000  
 POLARIZATION 0000 0000 0000  
 OPERATOR 30 0000 0000  
 COUNTRY 100 0000 0000  
 100.0000 0000 0000



6584- TEST GROUP NO.  
"OLIOVA", AIR NEW MEXICO  
247 5 47  
CONTINUED NO. 21401  
DATE 2 Jul 73 2 56 2400  
FREQUENCY 2000 Hz 0.15  
POLARIZATION III 81212 0.1  
OPERATOR JS  
CRATER 150  
20" Ball  
5" Pitch

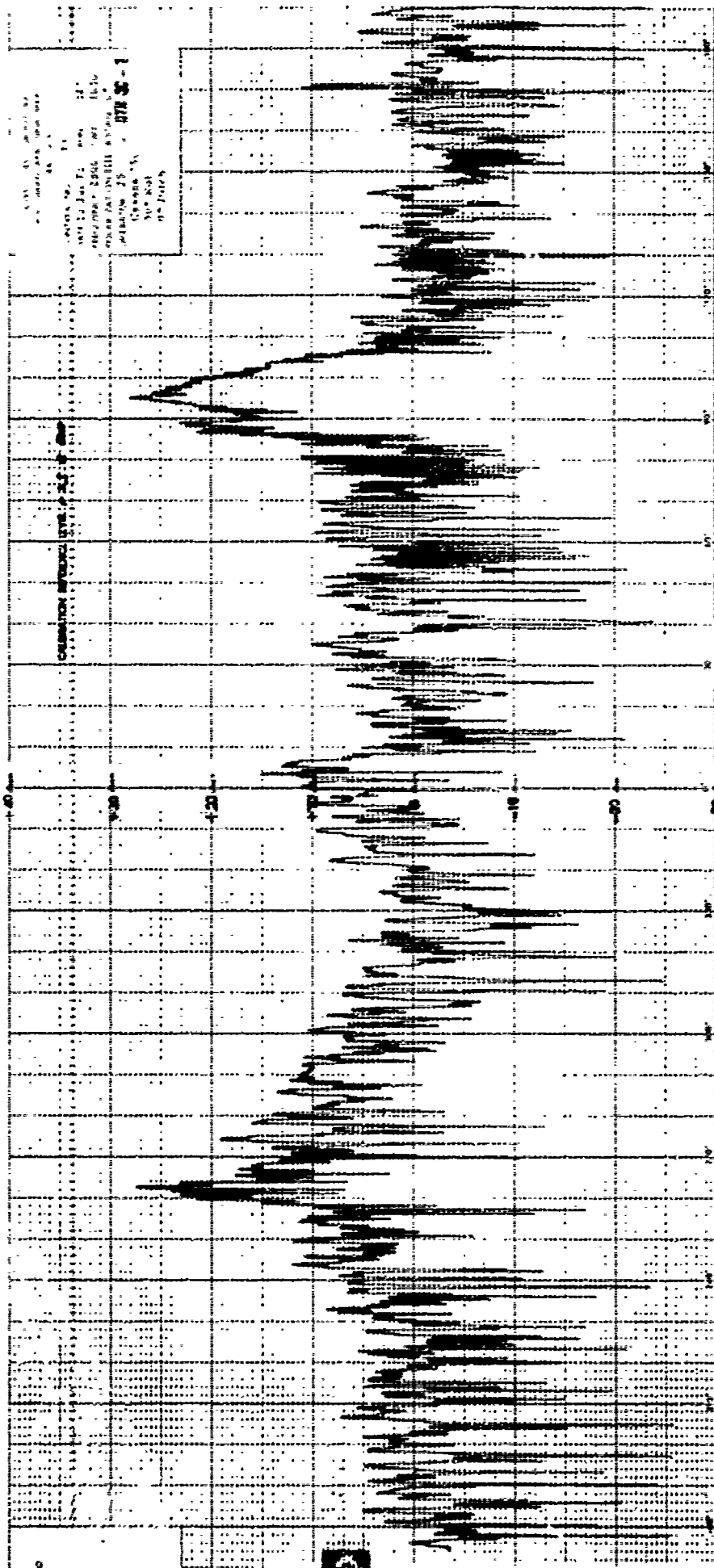


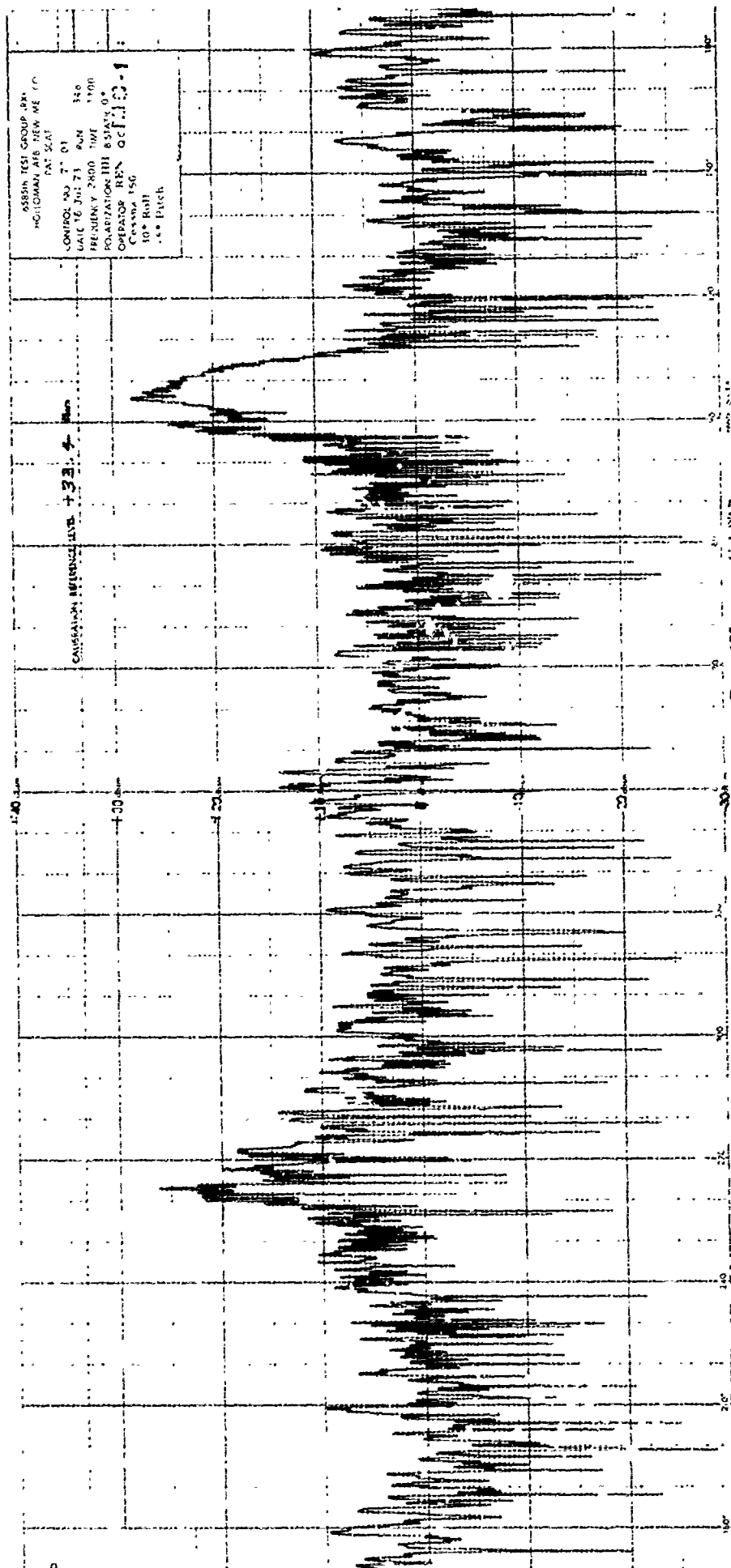




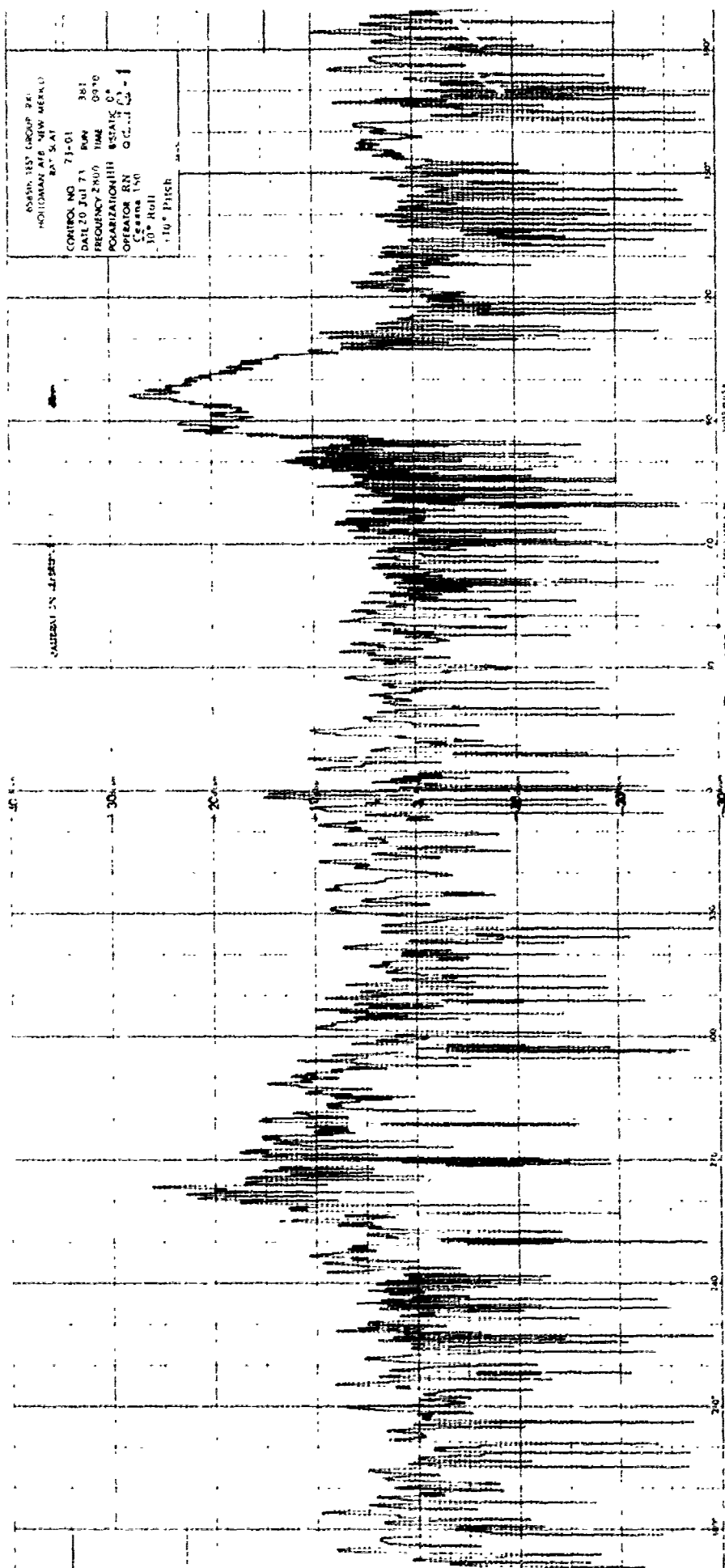
**WASH. POST AND LOCALS**

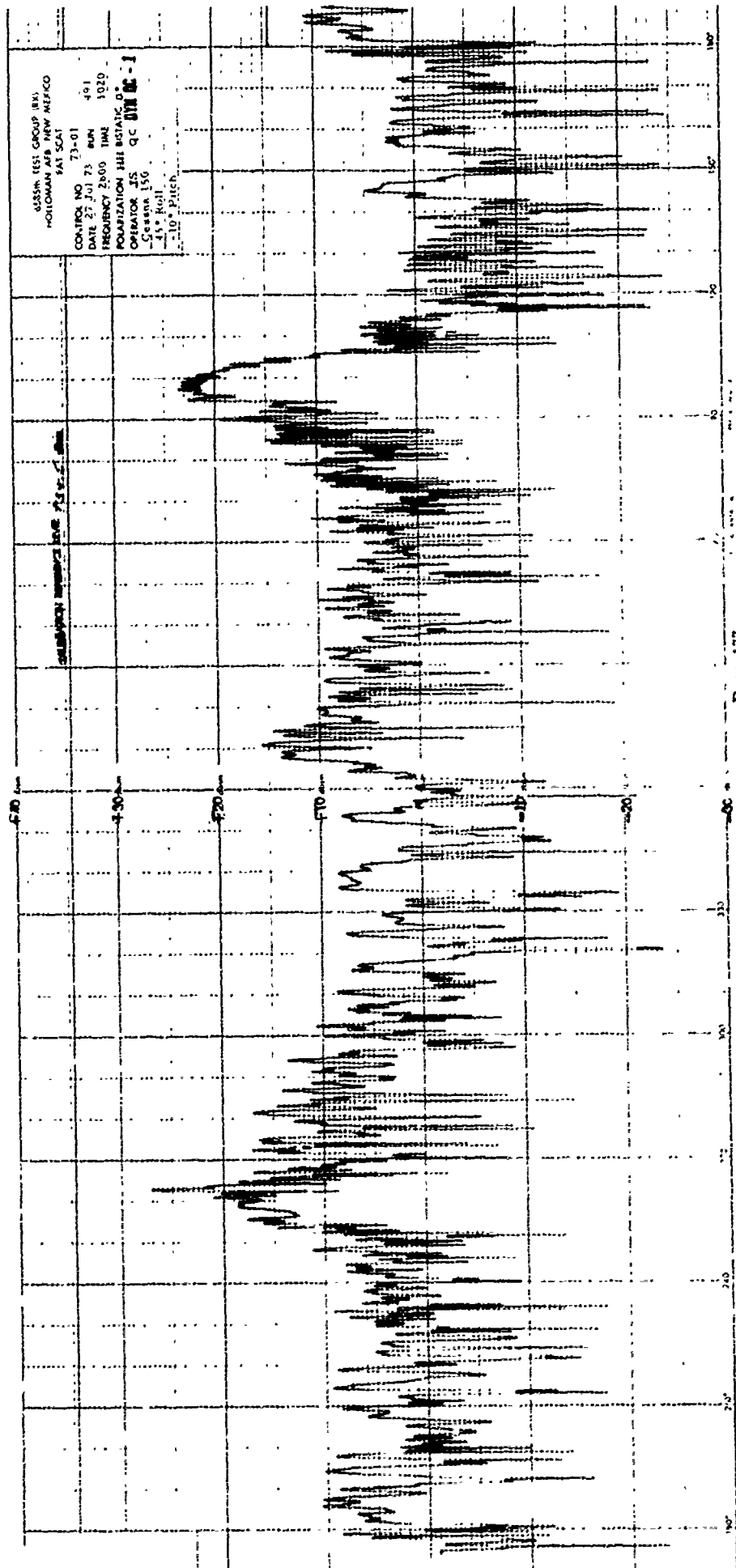
2000

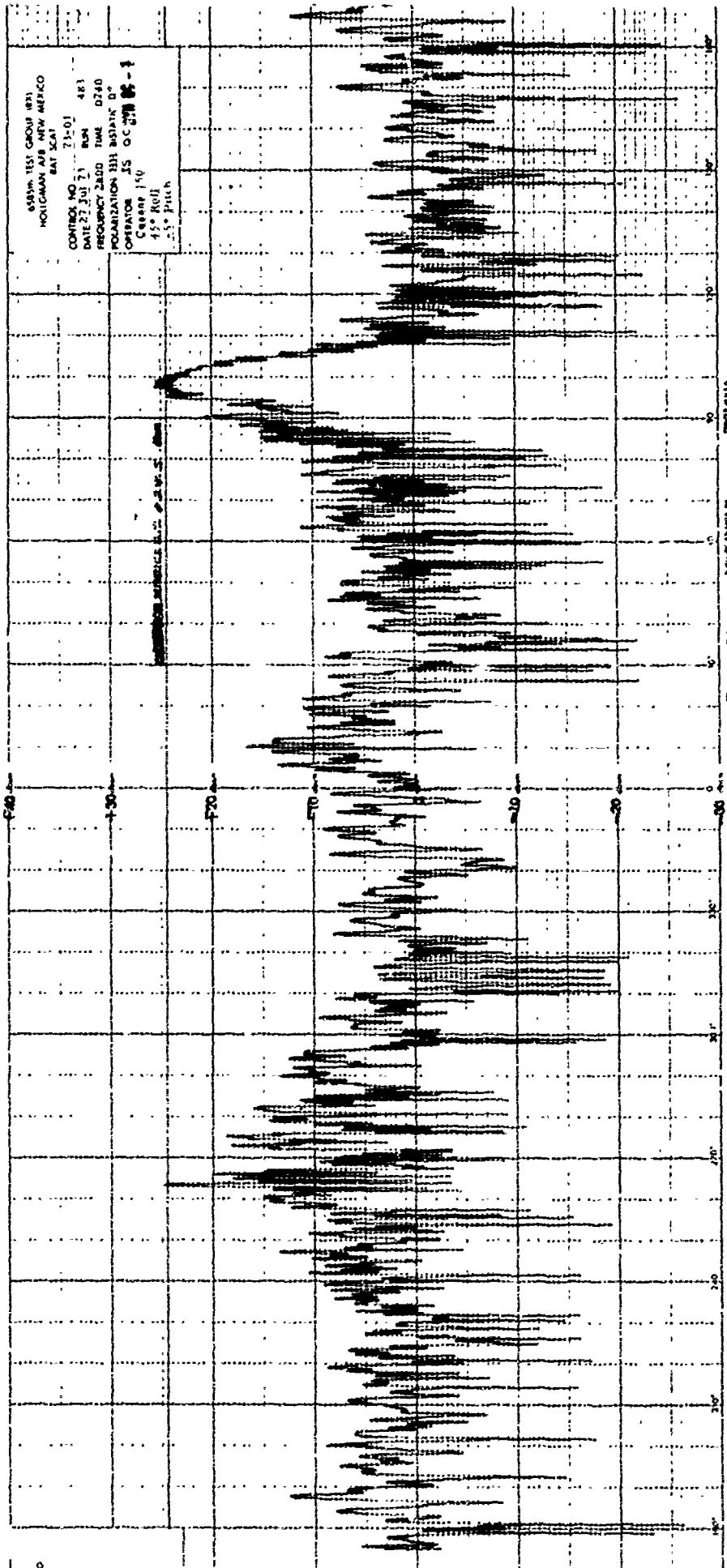


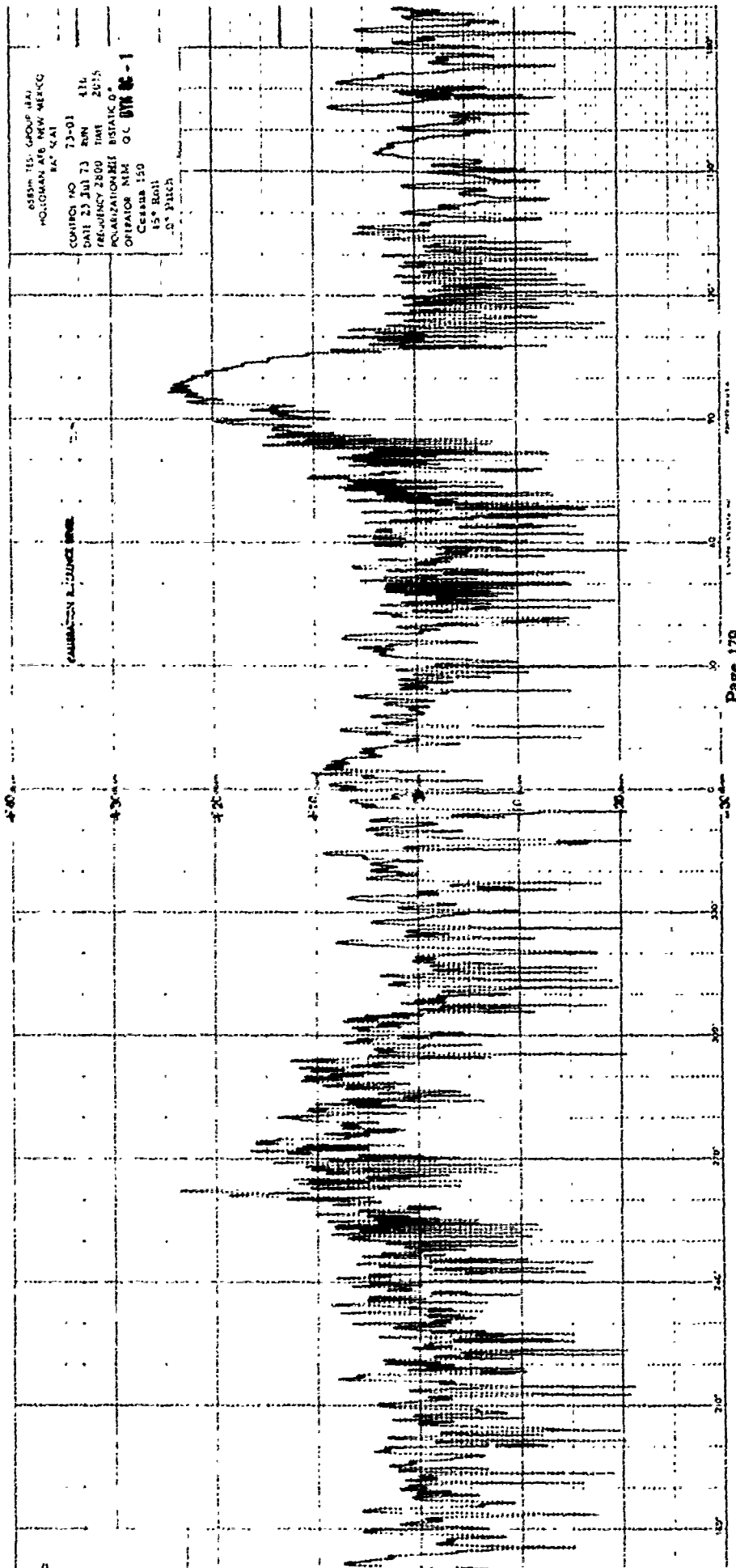


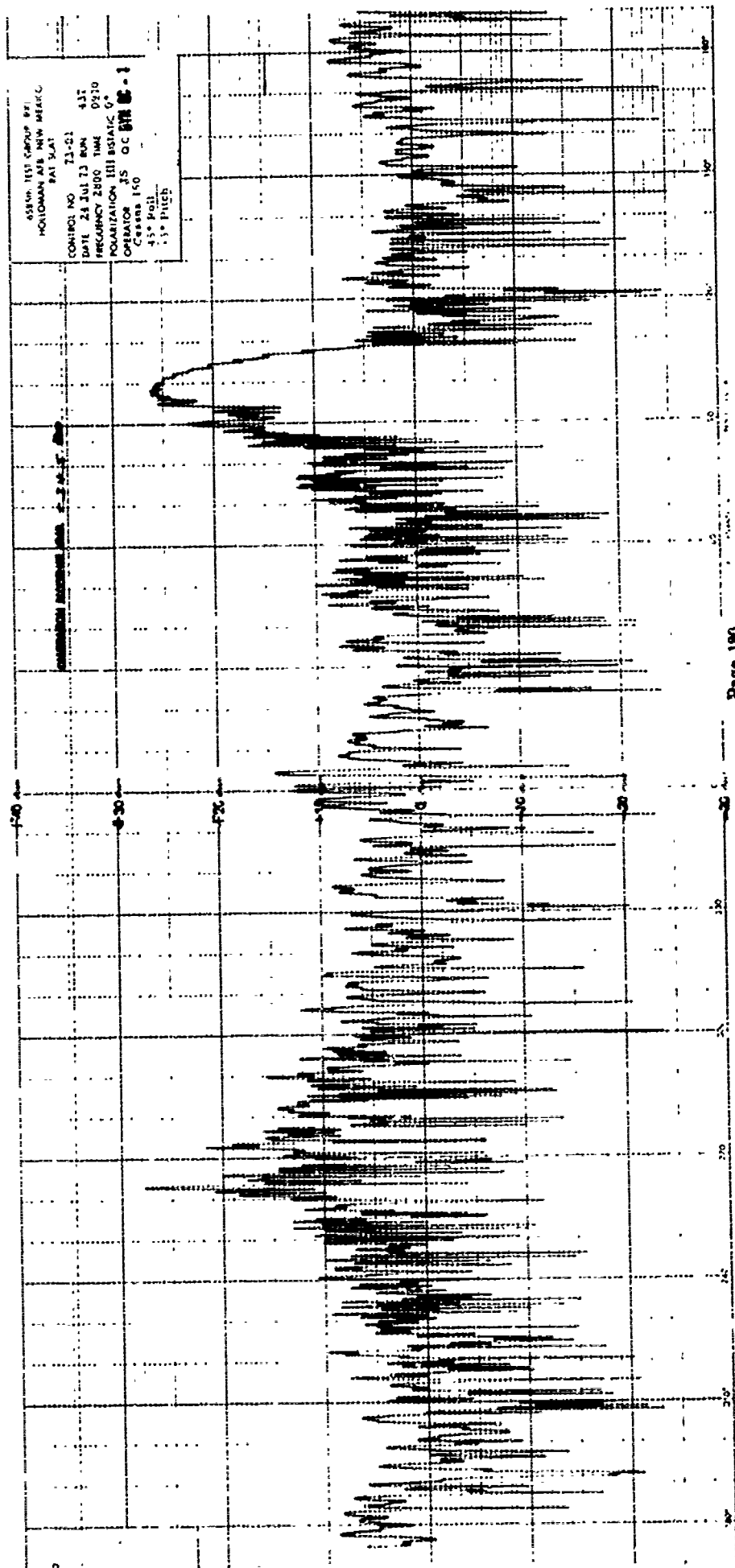


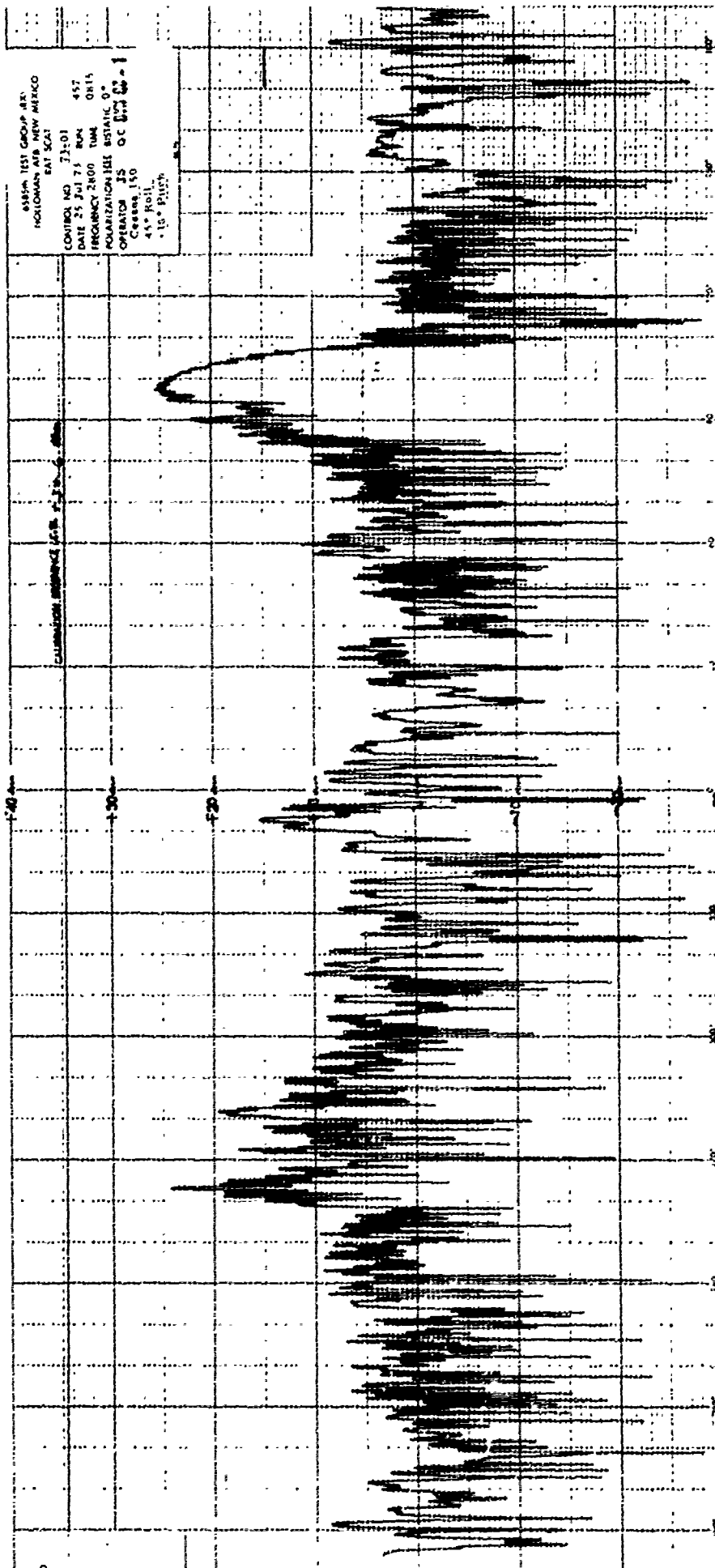


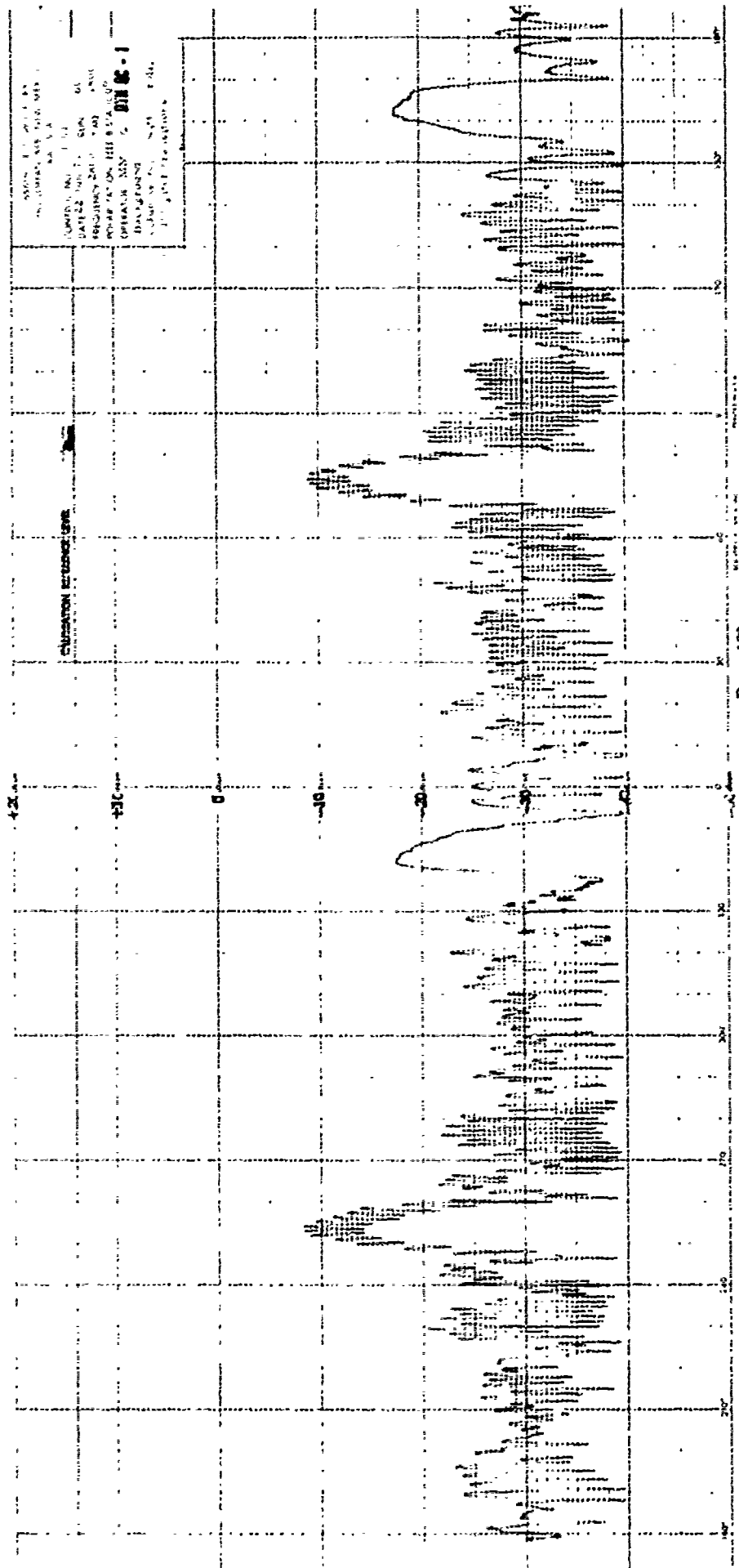




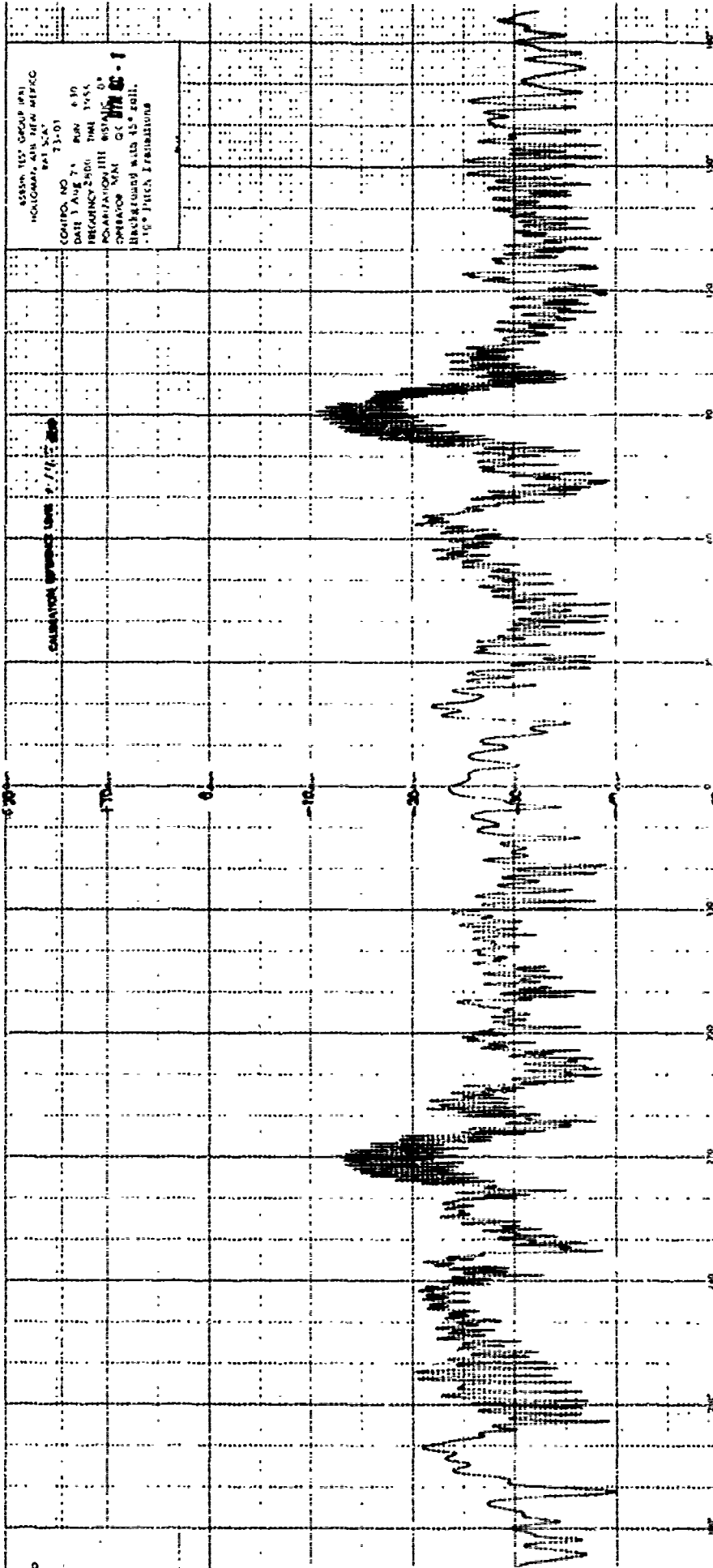




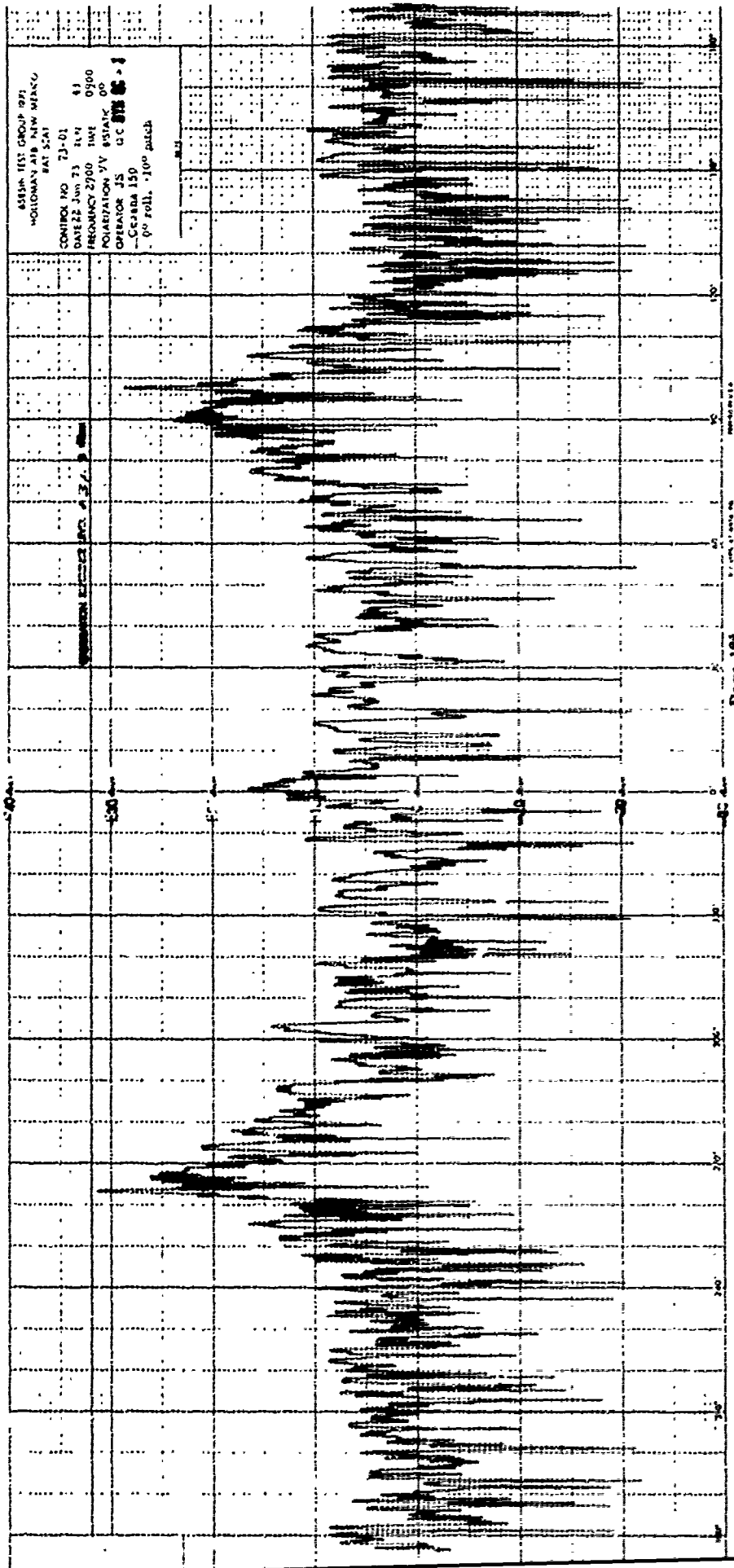


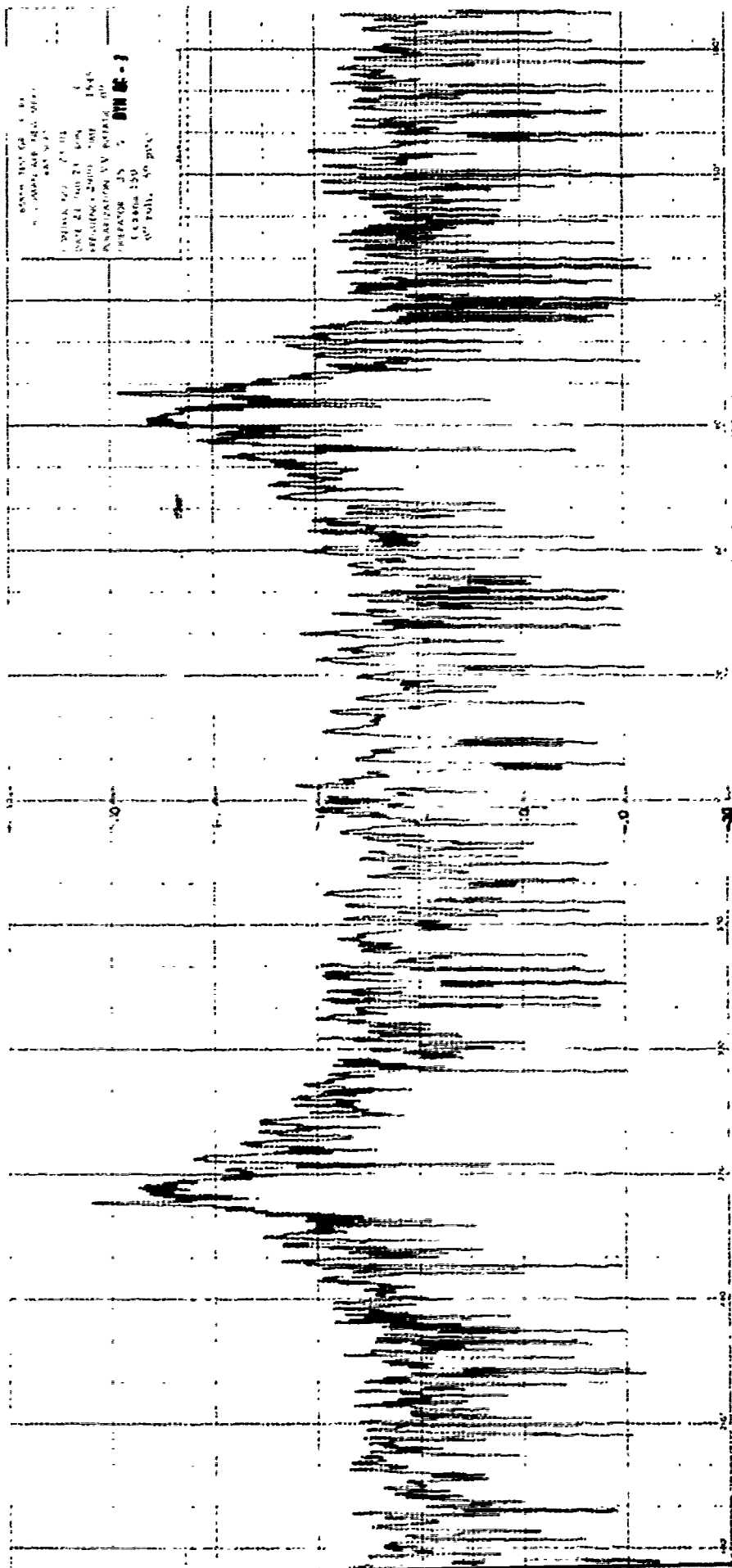


DATE: 11/11/54  
 TIME: 11:11  
 LOCATION: 111 8 1/2  
 FREQUENCY: 111 8 1/2  
 OPERATOR: 111 8 1/2  
 INSTRUMENT: 111 8 1/2  
 111 8 1/2







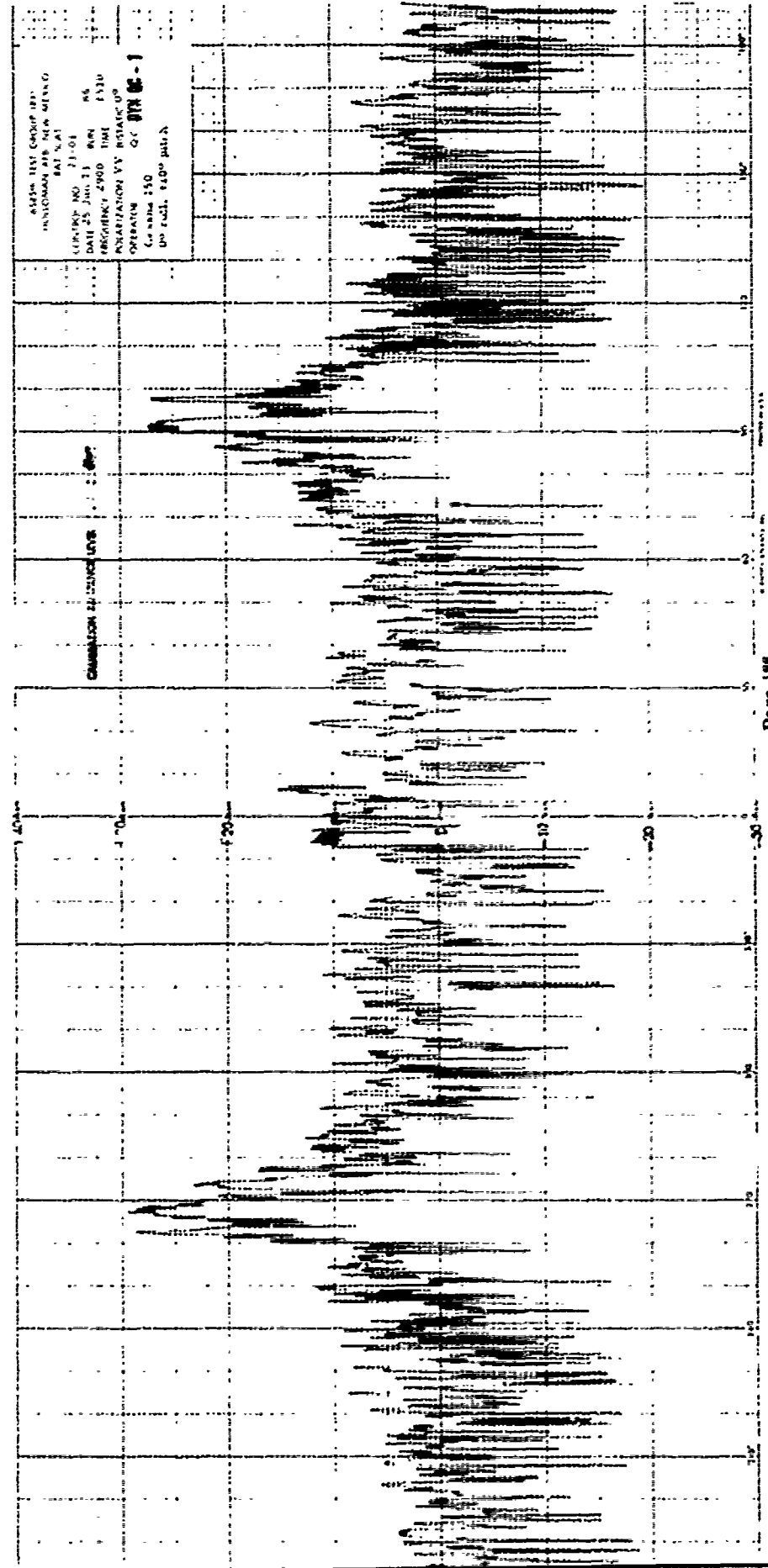




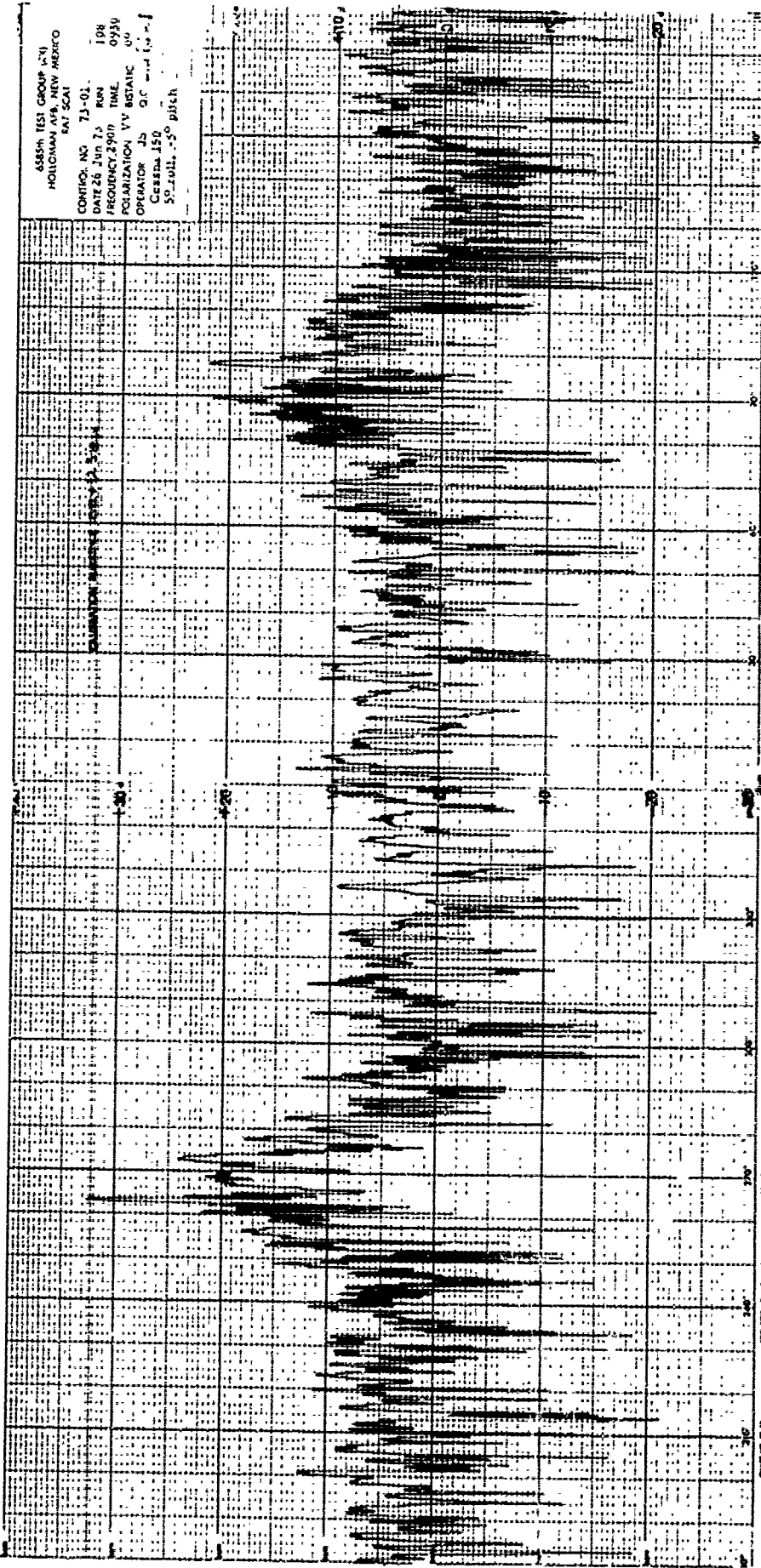
[illegible]

AIRMAN THE GROUP ID:  
 INDIANAN AIR NEW MEXICO  
 AIR NAL  
 COUNTRY NO. 21-01  
 DATE 25 Jan 11 AM 1910  
 FREQUENCY 2900 TIME  
 ORGANIZATION VV BIRACUP  
 OPERATOR GC  
 Co name 150  
 DO 1001 1400 p.m.

CUMULATION 20 21000 1000



6885H TEST GROUP (VI)  
 HOLLANDIA AFB, NEW MEXICO  
 EAT SCAT  
 CONTROL NO. 73-01  
 DATE 26 Jun 73 RUN 108  
 FREQUENCY 2900 HZ TIME 0939  
 POLARIZATION VV BEATC 00  
 OPERATOR JS  
 GRAIN 150  
 59 rolls, 5° pitch



ASPCA TEST GROUP (B1)  
MOTIONMAN AKA NEW MEXICO  
BAT SCAT

CONTROL NO. 73-011  
DATE 20 JUNE 71 - RUM 1221  
FREQUENCY 2350. TIME 0545  
POLARIZATION TV ESTIMATE 00  
OPERATOR NAME OC  
CRS 150  
50.302, -100.0118

0545-3

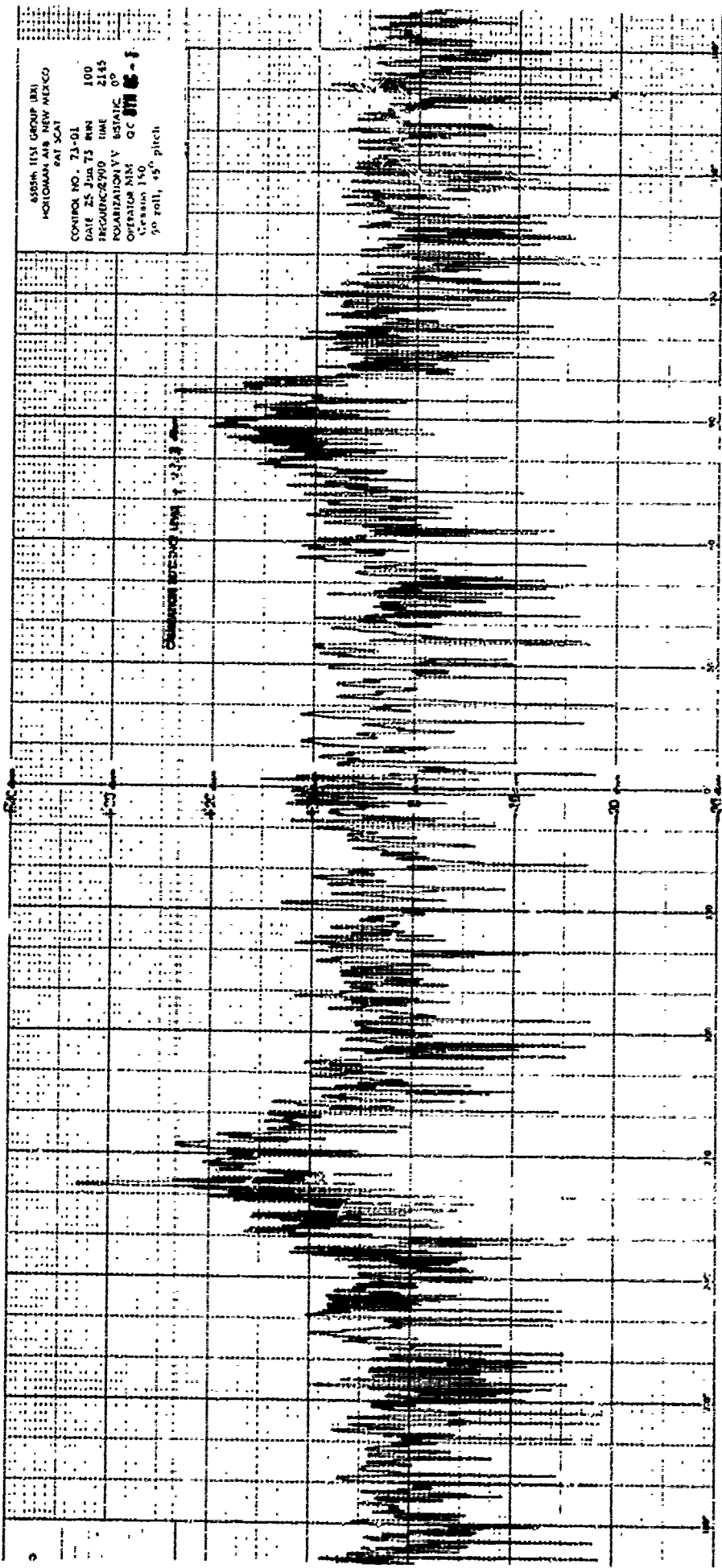
Distance in Miles 176.1 2.7 2.4

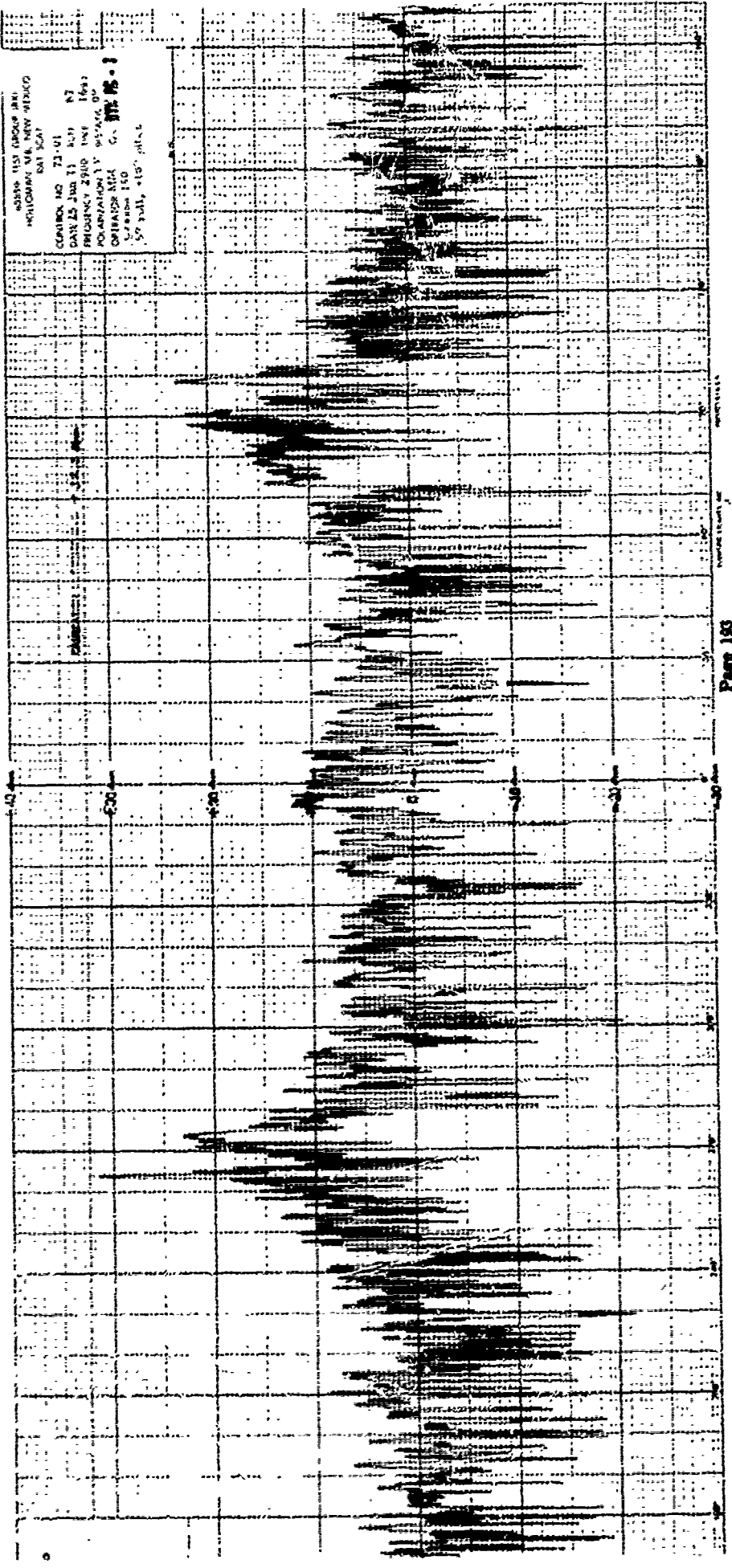
BL





ASBIR TEST GROUP (B)  
 HOTTOMAN AIR NEW MEXCO  
 PAT SCAT  
 CONTROL NO. 73-01  
 DATE 25 JUN 73 TIME 100  
 FREQUENCY 9900 MHz 2145  
 POLARIZATION VV STATIC OP  
 OPERATOR NIM QC 8718-1  
 Gearing 150  
 30 roll, 45 pitch





AREA 151 GROUP (B)  
HOLLAND AFB, NEW MEXICO  
SAT MAY

CONV NO 21-01

SAT 23 JUN 73 14:15

FREQUENCY 2130 MHz

MODULATOR TV STATIC

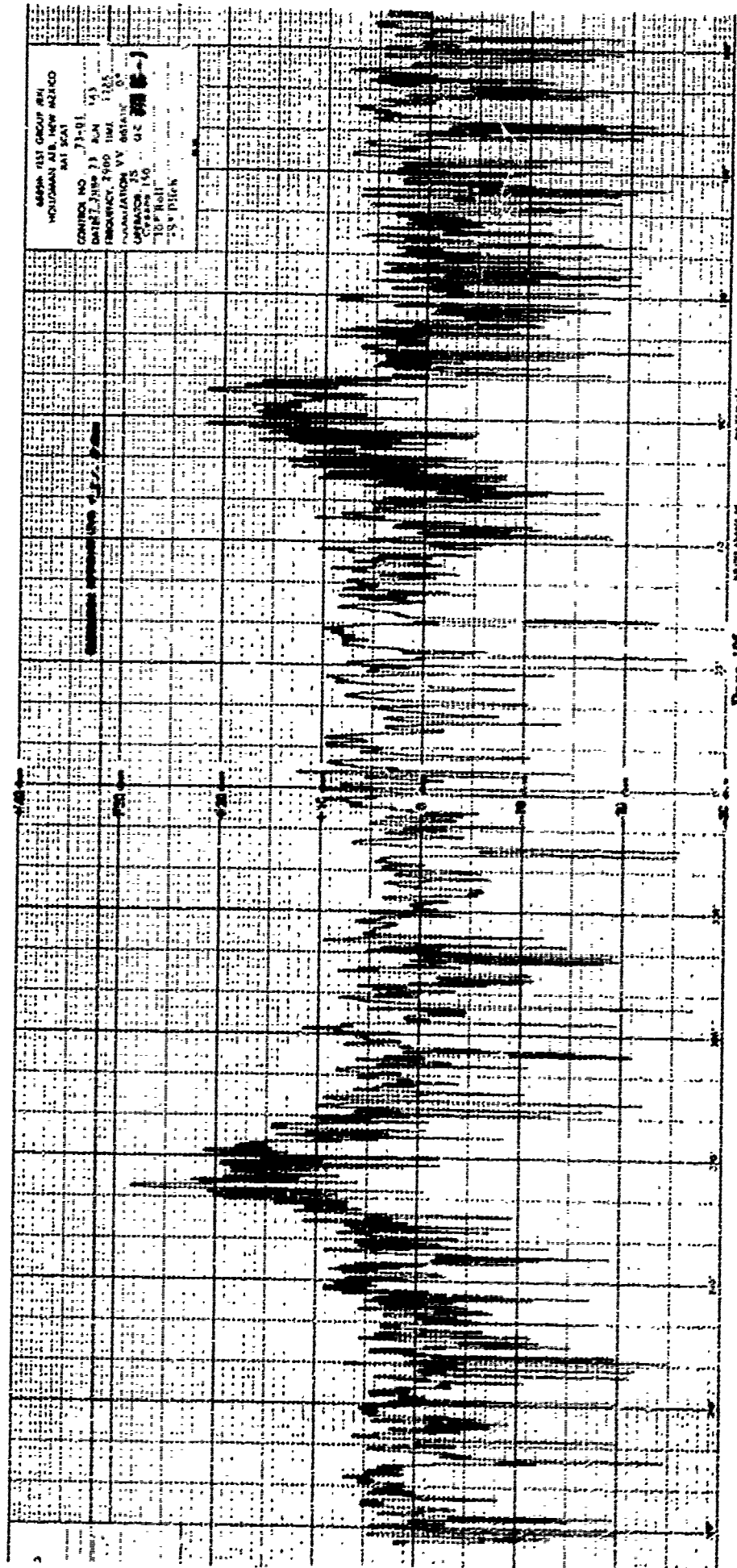
OPERATOR 150

GROUP 150

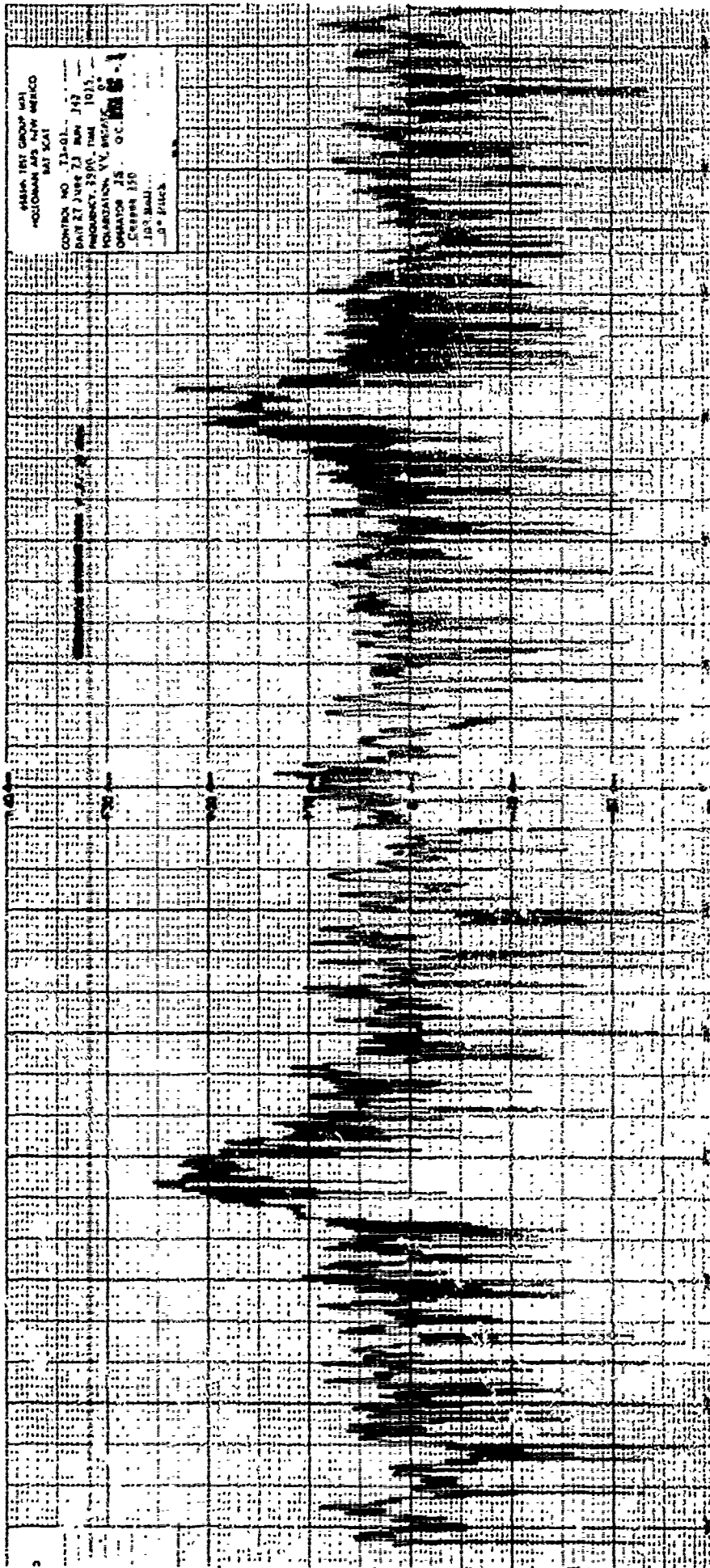
TO Roll

\*10° Pitch

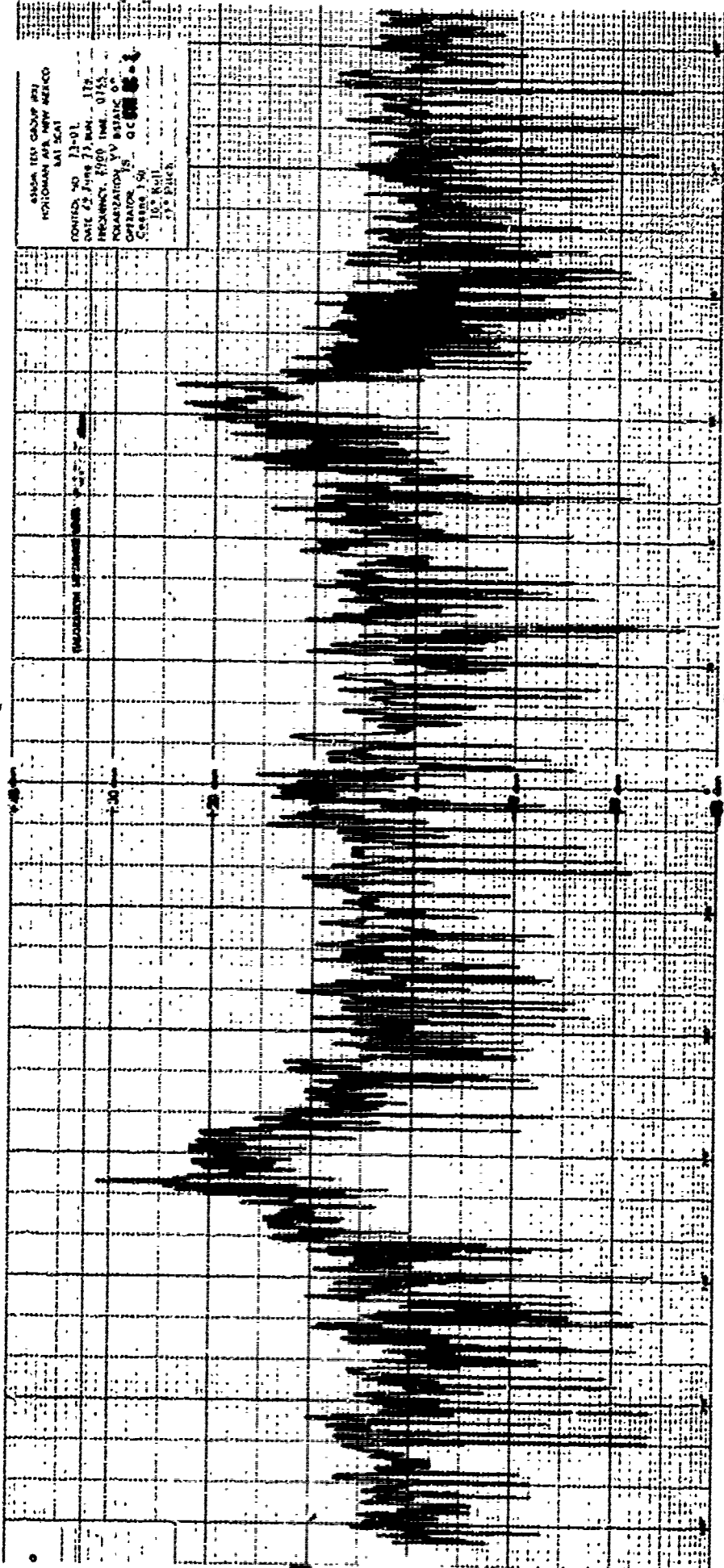
Channel 151-01



GROUP 113 GROUP 114  
HOLDSMAN AIR NEW MEXICO  
DATE 7-1-81  
CONTROL NO 77-01  
TIME 11:00 AM  
FREQUENCY 1000 MHz  
PULSATION VV 0.125  
OPERATOR JS  
CROSSING 100  
TO Roll  
250 MHz



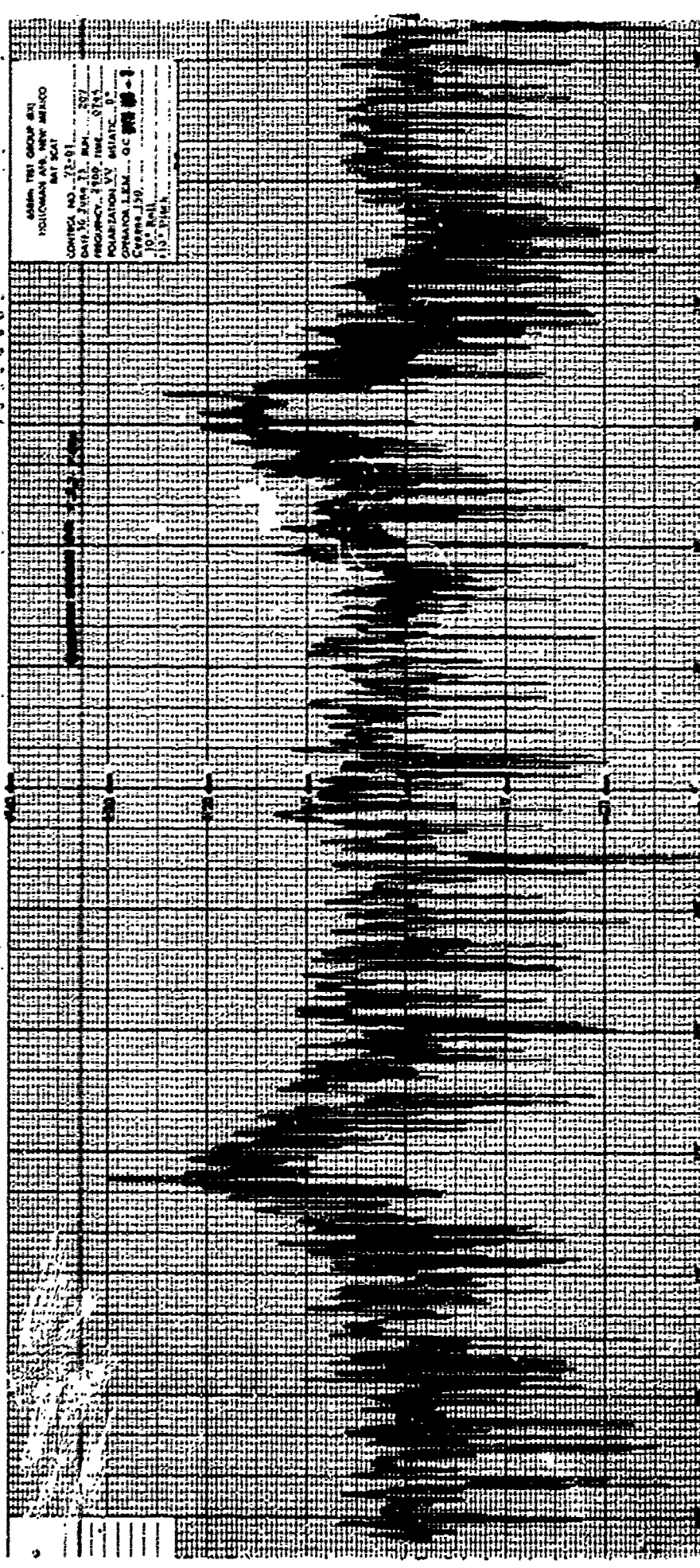
ANALYST: J. J. GARDNER JR.  
HOLLOMAN AFB, NEW MEXICO  
SAT 501  
UNIT: 11-01  
DATE: 22 Aug 71, 11:00 AM  
FREQUENCY: 110.0 MHz  
MODULATION: TV STATIC  
OPERATOR: J. J. GARDNER JR.  
CARRIER: 110.0 MHz  
100% Mod  
100% Pitch

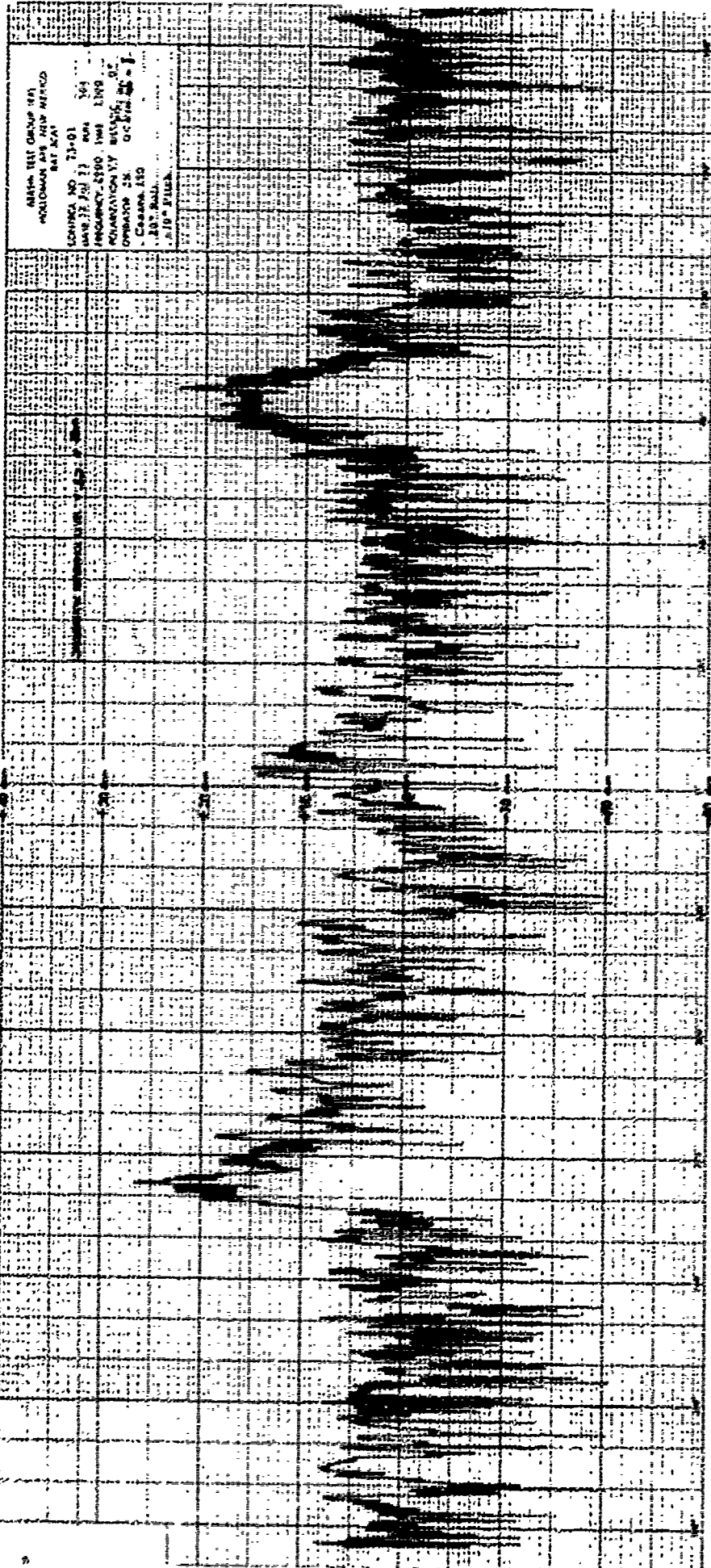




ASIAN TEST GROUP 811  
HOLCOMB AVE. NEW BRUNSWICK  
NJ 07102

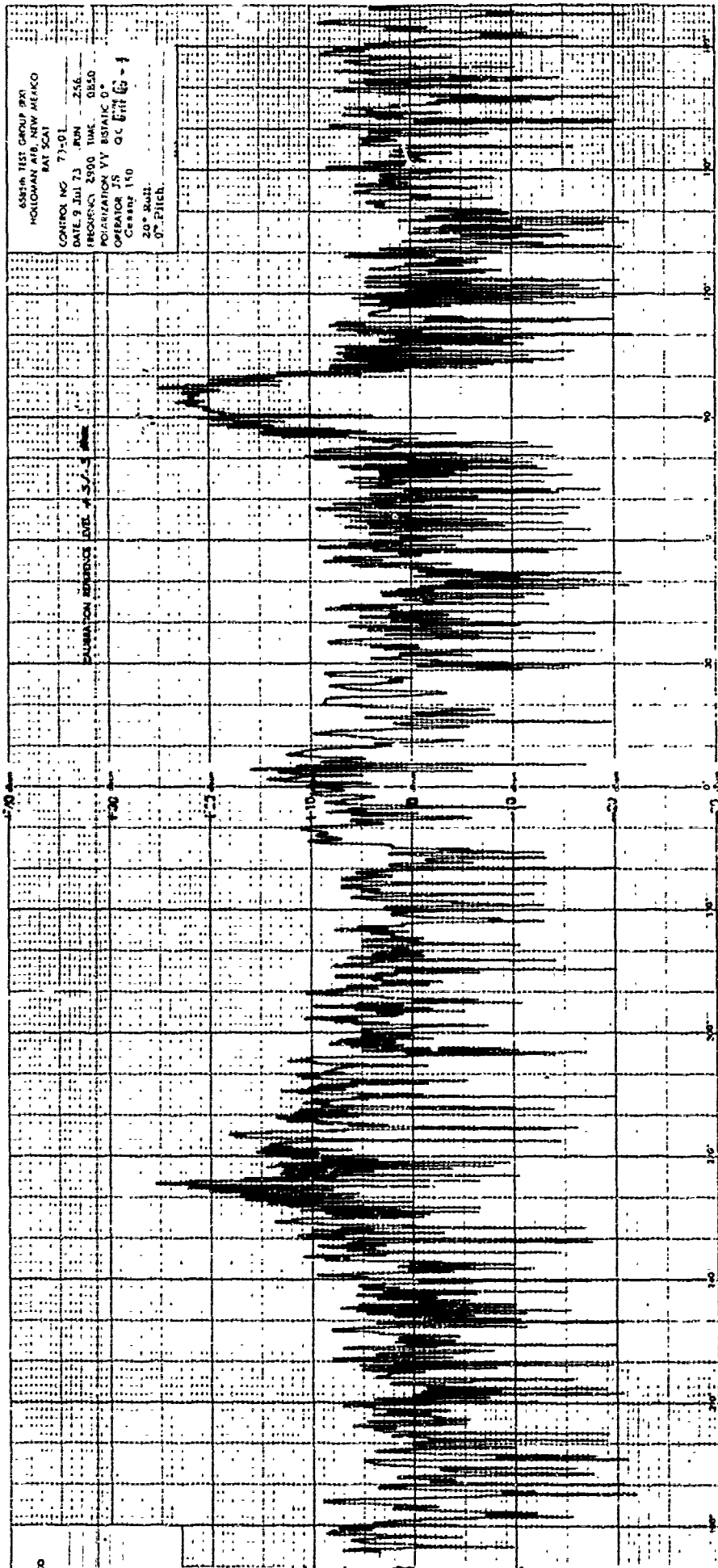
CONTROL NO. 12-81  
DATE TO RUN 7-1-81  
FREQUENCY 1000 Hz  
POLARIZATION VV  
ORIENTATION LEM. 0°  
CROSSHAIR 150  
10" Bell  
10" Pitch

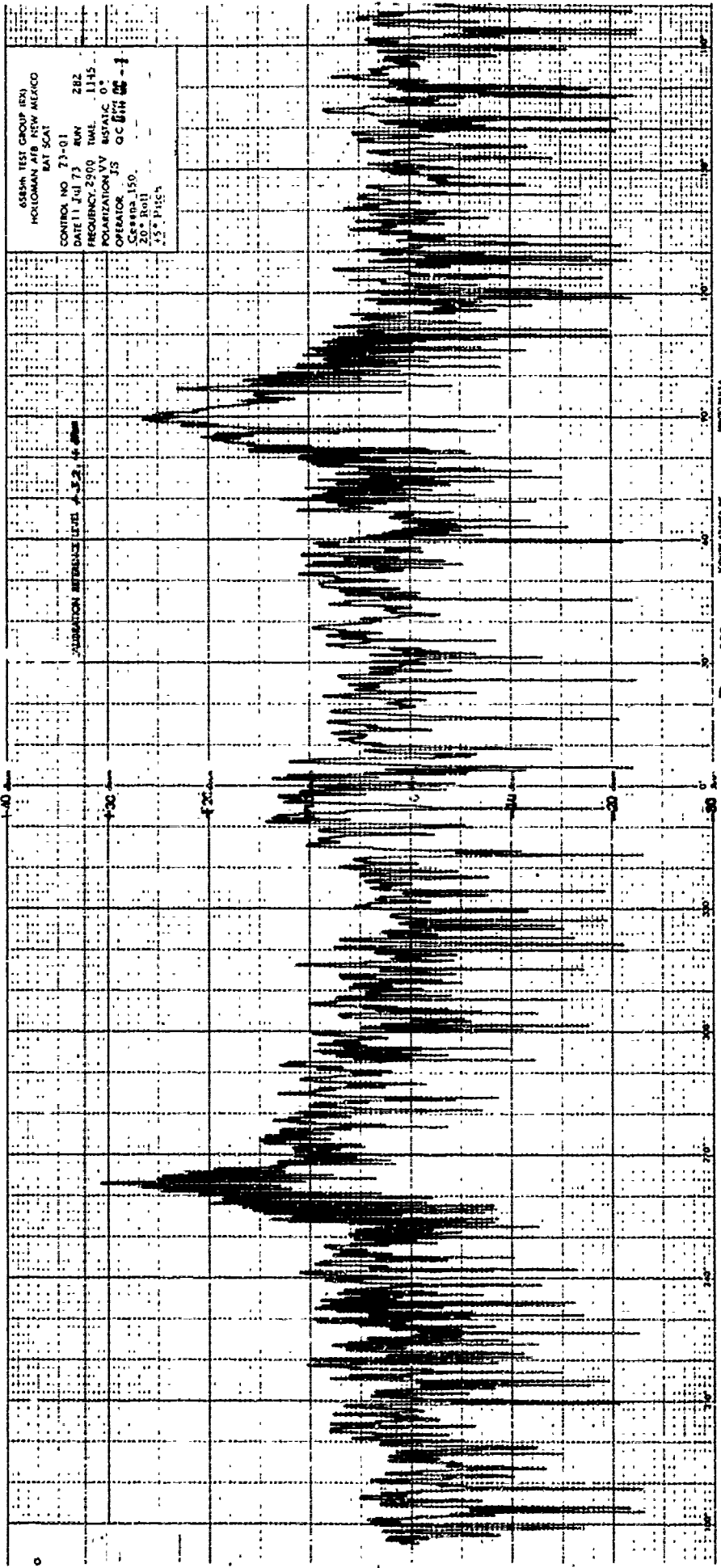


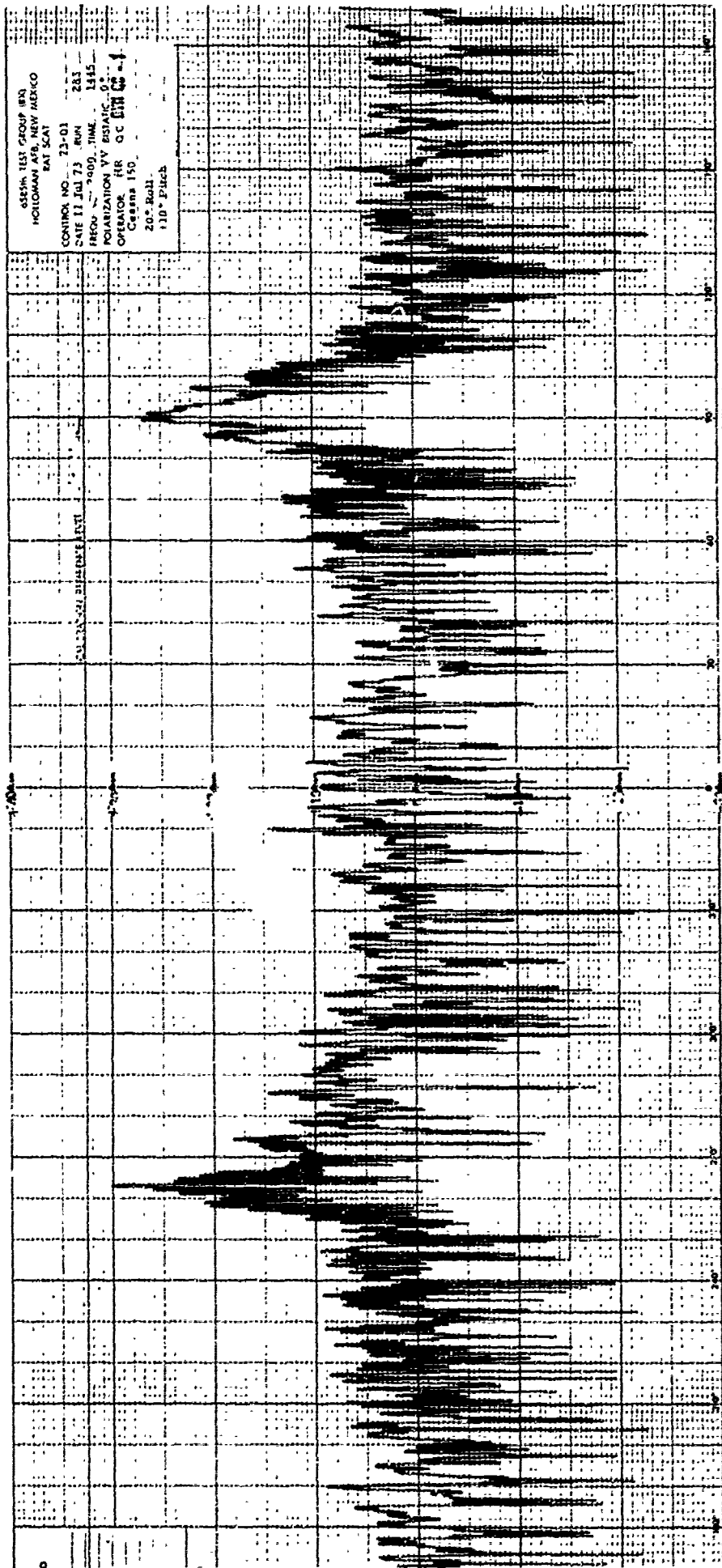




SYSTEM: IRI GROUP (RI)  
 WATZMANI AND NEW MAAD  
 AT NCAI  
 CONTROL NO. 71-01  
 DATE: 12 JUL 73 TIME: 1015  
 HOURS: 2100 DAY: 1083  
 LOCATION: V 100150 02  
 ORIGIN: 25 02 00 02  
 SPEED: 100  
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6585th TEST GROUP (BX)  
HOLLAND AFB, NEW MEXICO

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**Abstract**

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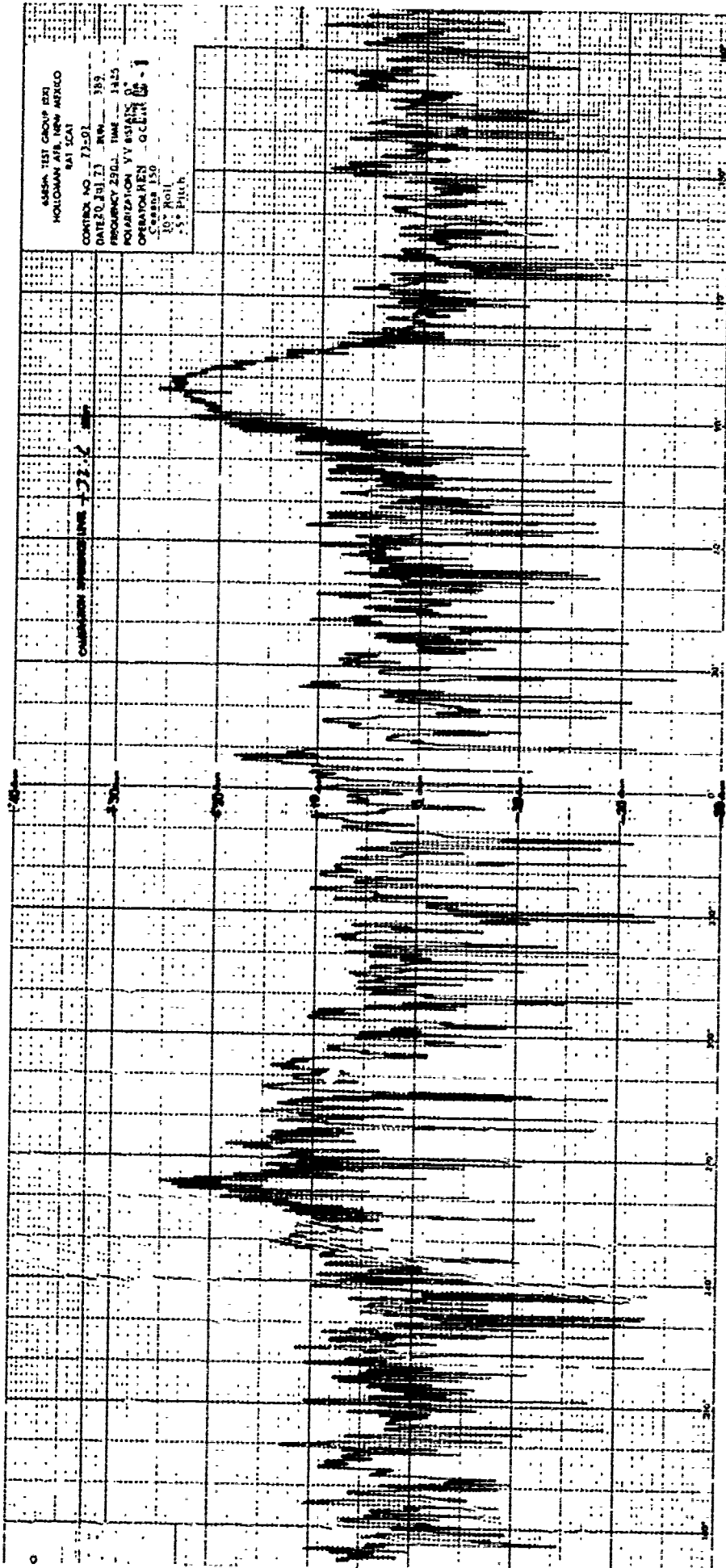
Österreichische Nationalbank  
Z. Nr. 123.6

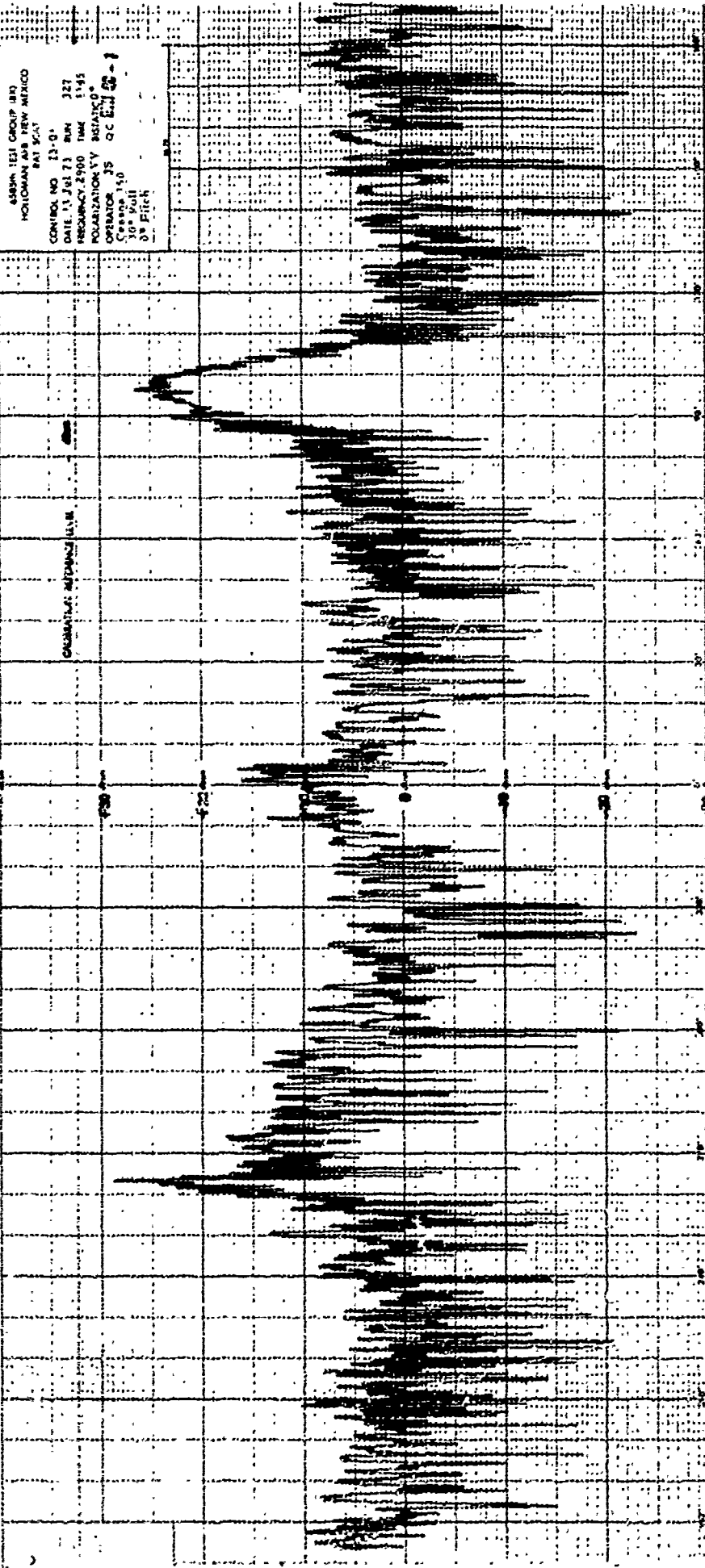
Page 204

ASSEA TEST GROUP 821  
HOLLOMAN AFB, NEW MEXICO  
SAT SCAT

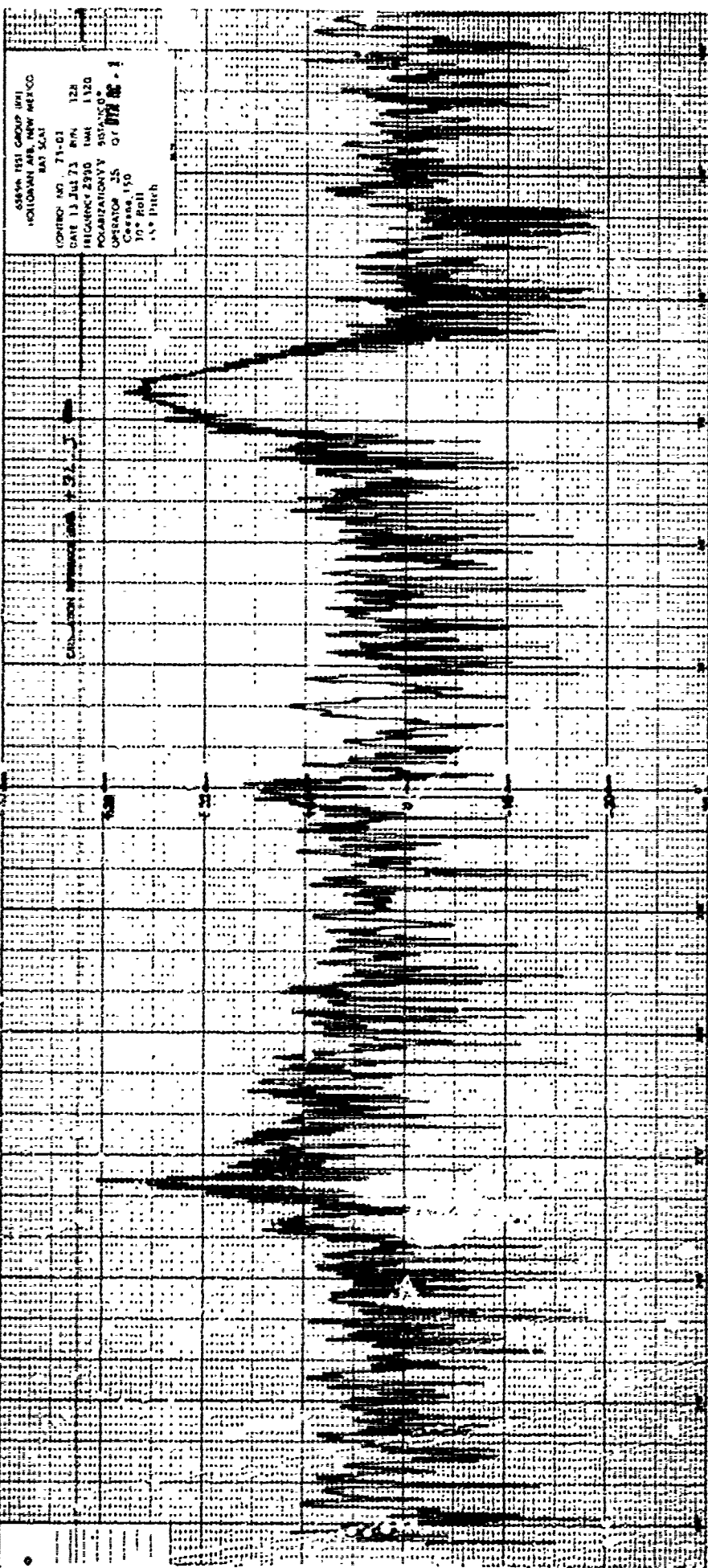
CORREL NO 72-01  
DATE 20 JUL 73 RW 389  
FREQUENCY 290.1 TIME 1425  
POLARIZATION VV STATION 0  
OPERATOR KEN - GCMR 65-1  
- Cease 150  
10" Roll  
- 5" Pitch

CUSTOMER TRANSMISSION 72-2



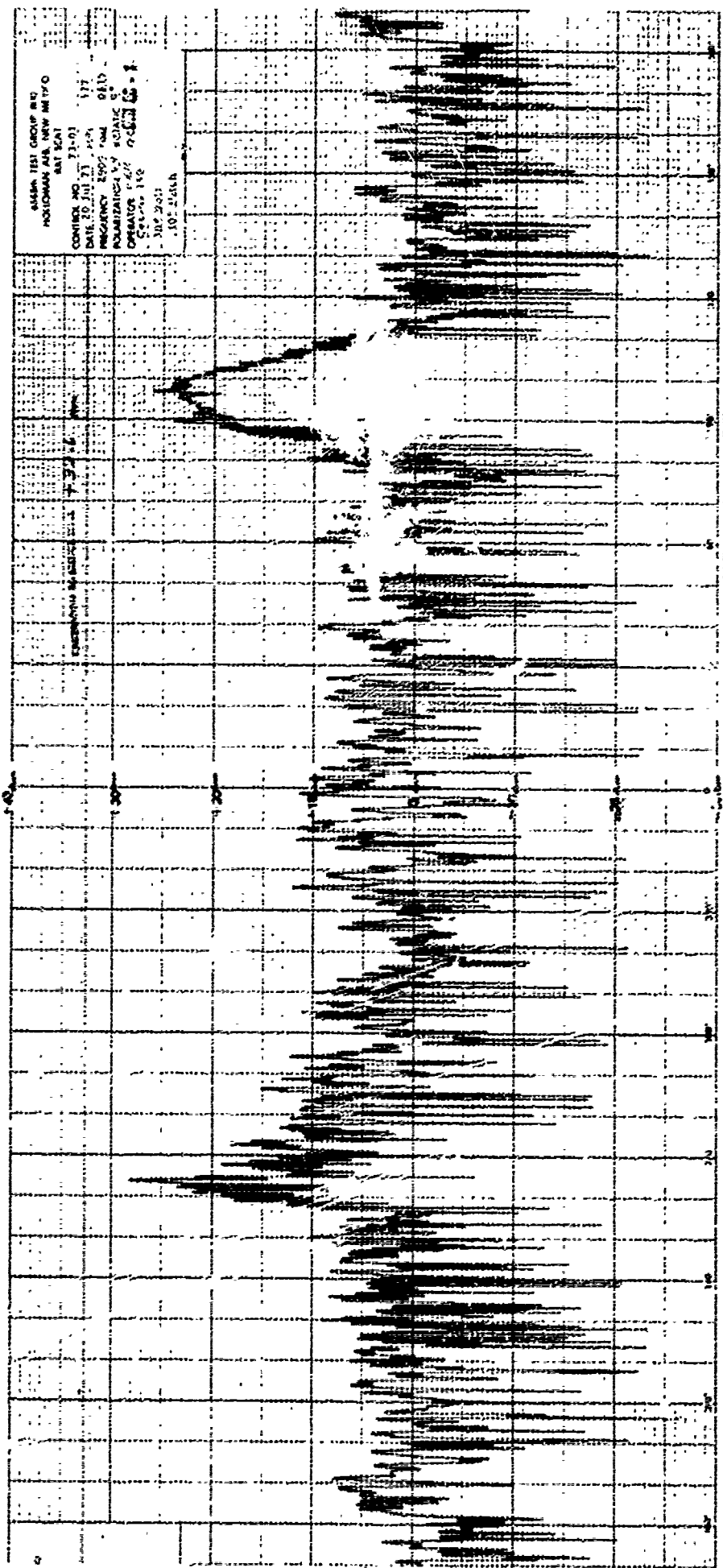






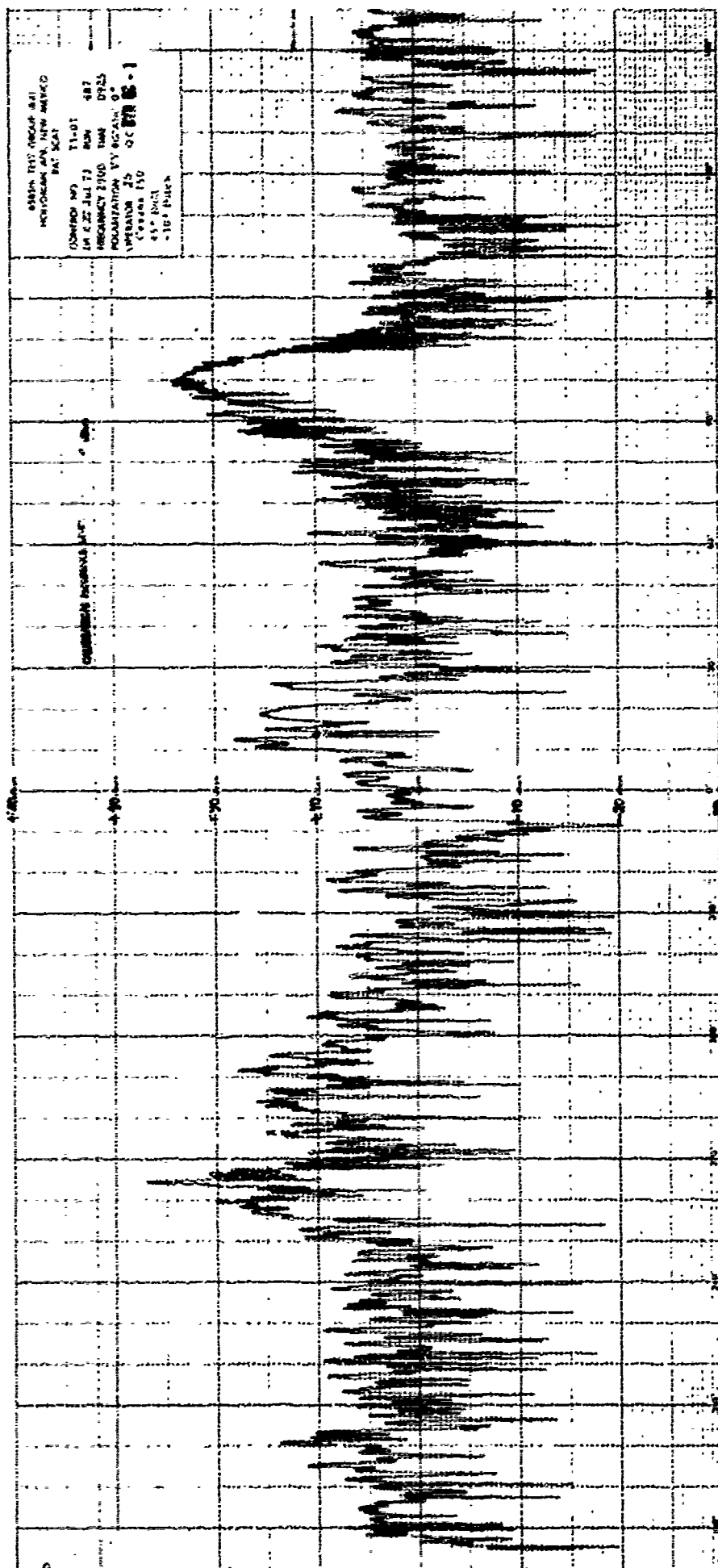
SENA TEST GROUP (H)  
HOLLAND AFB, NEW MEXICO  
BAT SCAT  
CONTING NO. 71-01  
DATE 13 JUL 73 BY 128  
RECORD 2350 TIME 1120  
POLARIZATION V 95°  
OPERATOR JS 070800  
Cassette 150  
10" Roll  
1/2" Pitch

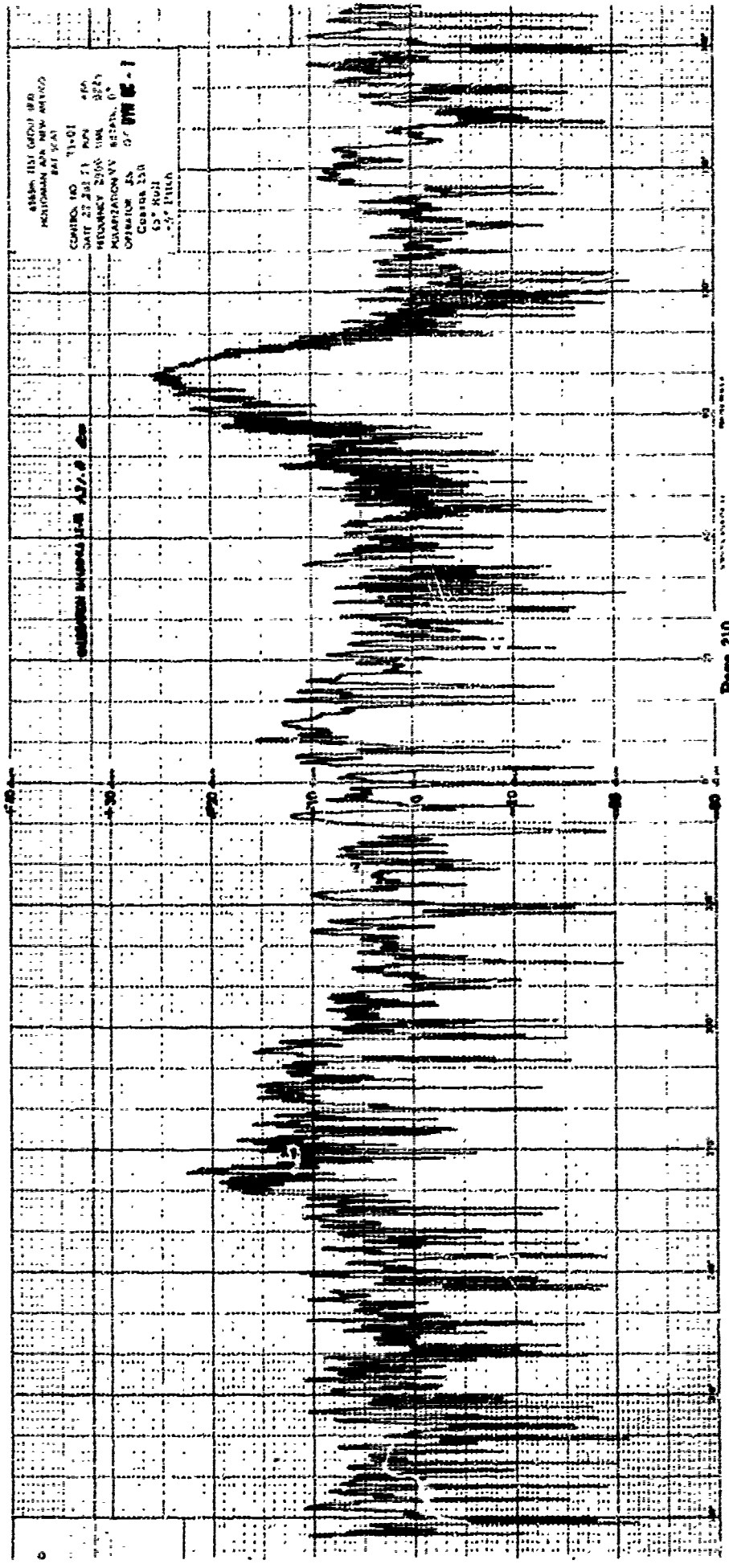




050144 TR-17 (SECRET) (U)  
MEMORANDUM FOR: JCS AND JCEC  
SUBJ: SCAR

(UNCLASSIFIED)  
 14 JUL 73  
 PROBABLY 2100  
 RECONNAISSANCE  
 OPERATION 15  
 45° 30'N  
 10° 30'W







619544 TEST GROUP 18X1  
MOLLOMAN AFB, NEW MEXICO  
EAT SCAT

INCH NO. 75-91

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2400 10000

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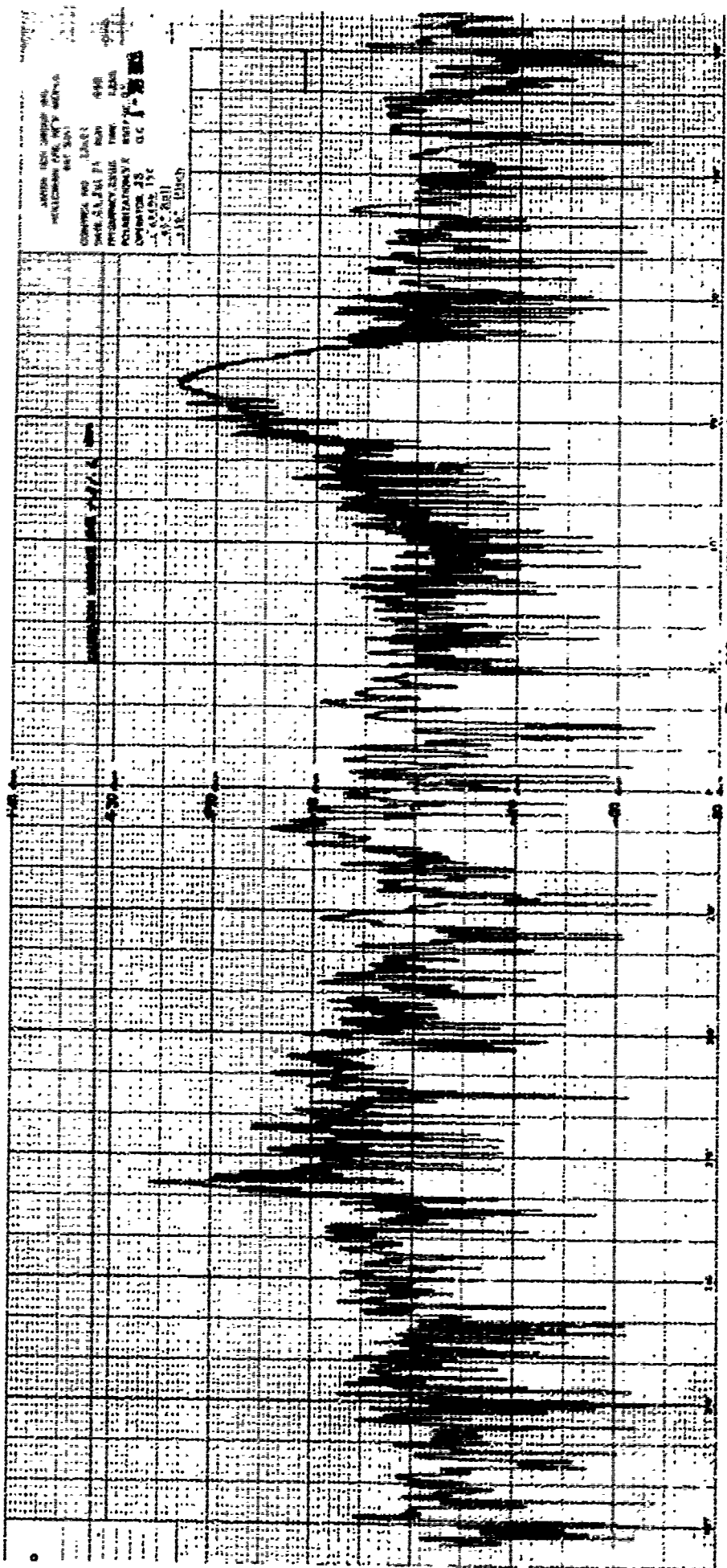
## Roll

18

**WILLIAM L. BROWN**

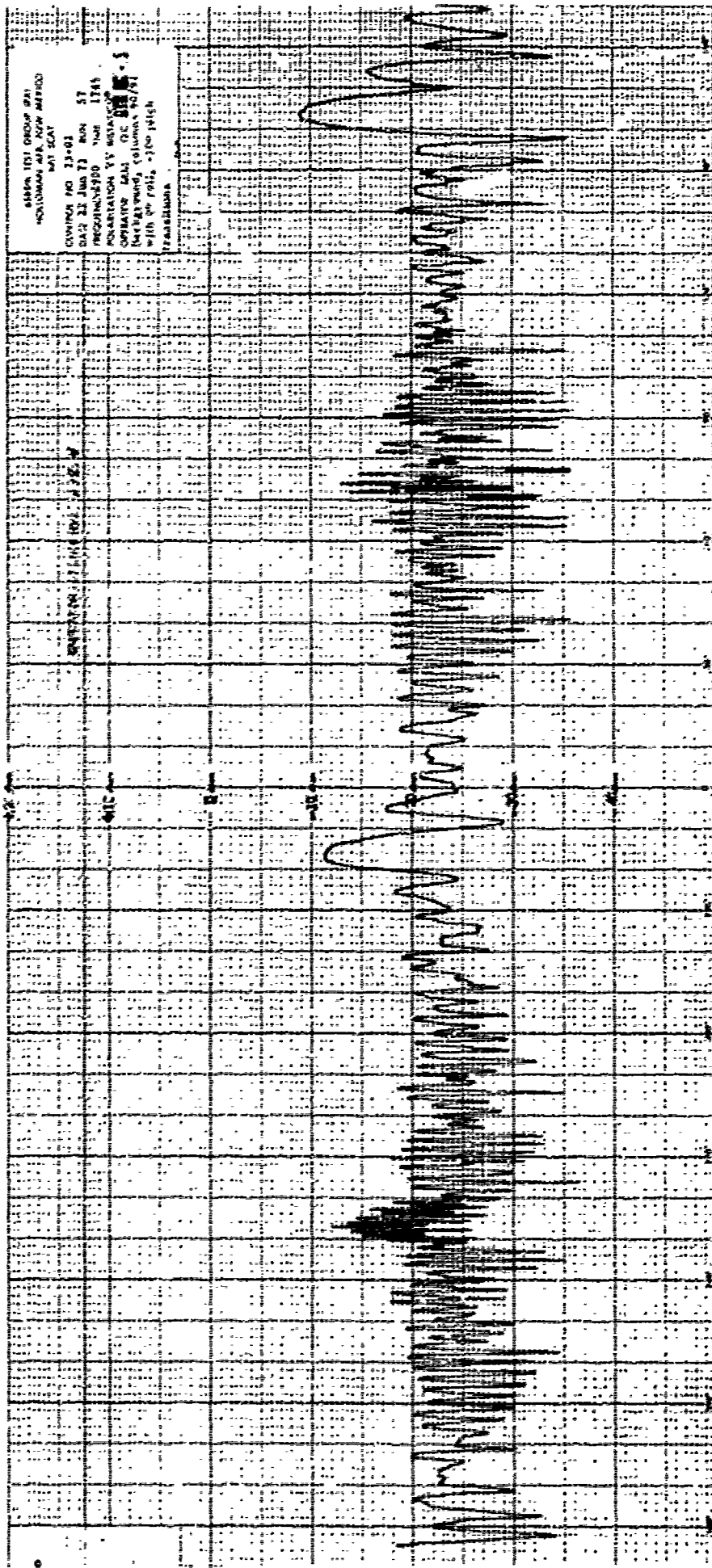
THE UNIVERSITY OF CHICAGO

Page 212

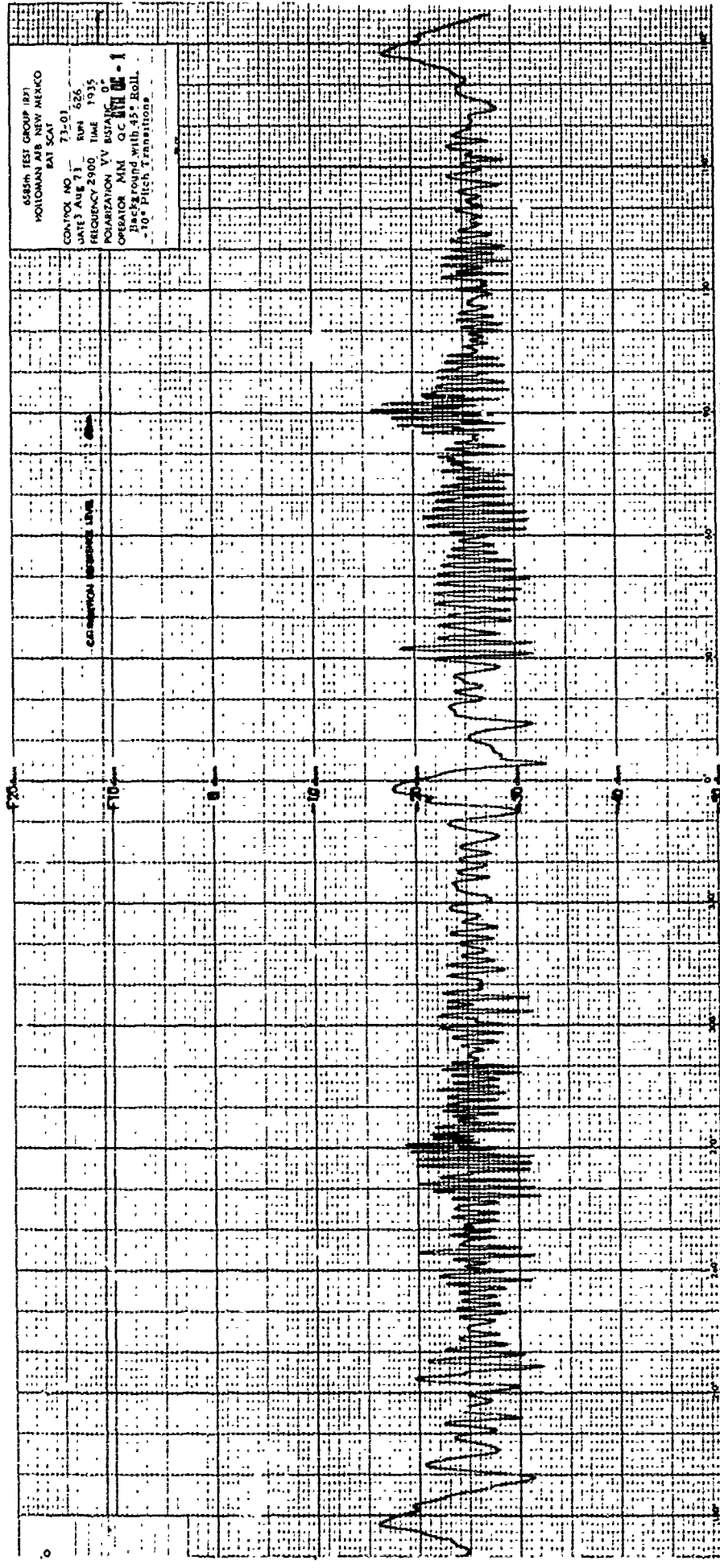


ADDITIONAL DATA SHEET  
INSTRUCTIONS FOR THE USER  
SEE PAGE 1

COMMENTS: NO DATA  
DATE: 5/1/84 BY: [illegible]  
PREPARED BY: [illegible]  
REVISION: 1.0  
OPERATION: 1.0  
C.C. 1-20-84









6583R TEST GROUP (B)  
HOLLOMAN AFB, NEW MEXICO  
EAT SCAT

CONTROL NO. 73-01

DATE 22 Jun 73 RUN - 44

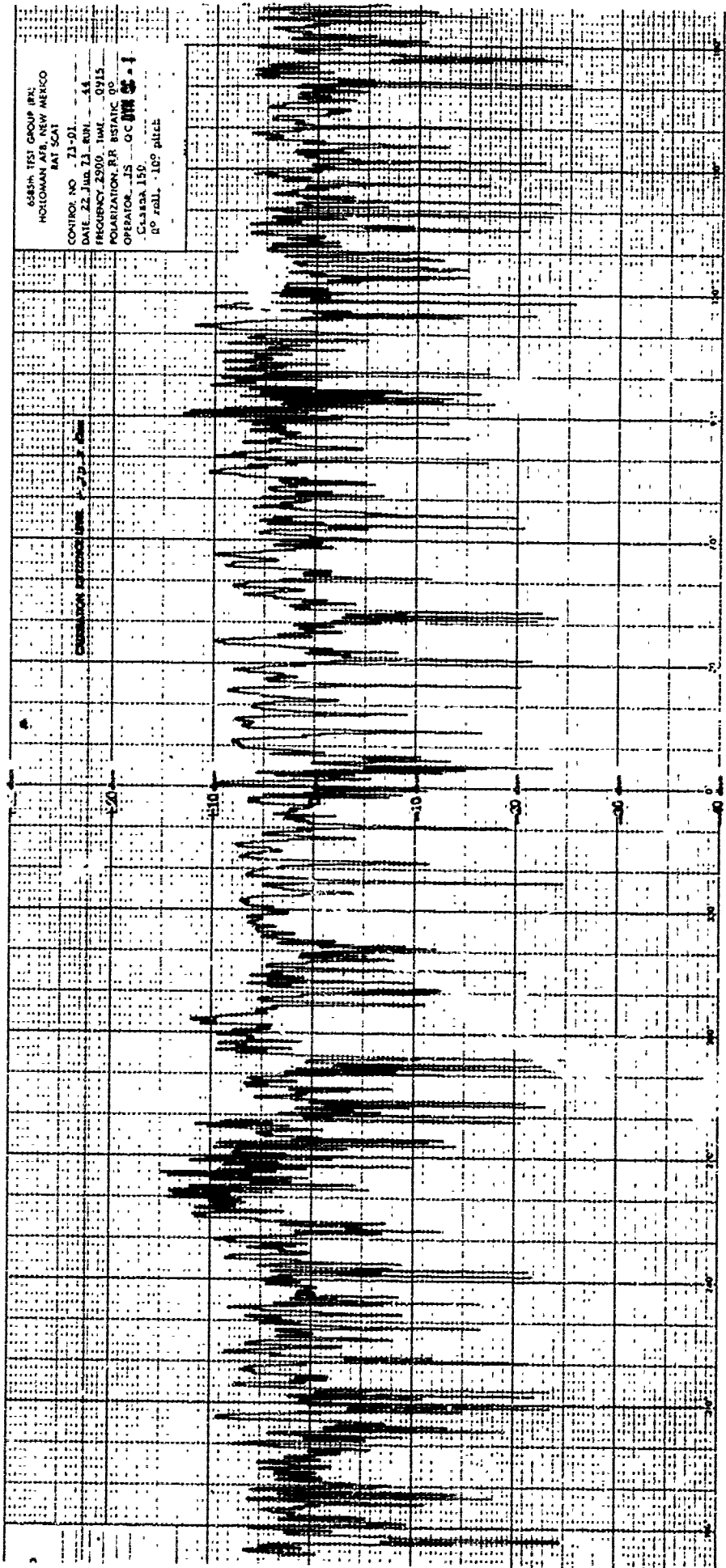
FREQUENCY 2900 MHz 0915

POLARIZATION RR RSTATIC 00

OPERATOR JS OC 000000 = 1

CLASS 150 100 MHz

COMPARISON FREQUENCY 2900 MHz



ASMA TEST GROUP 830  
HOLLAND AFB, NEW MEXICO  
BAT SCAT

CONTROL NO. 71-01

DATE 21 Jun 73 RUN 50

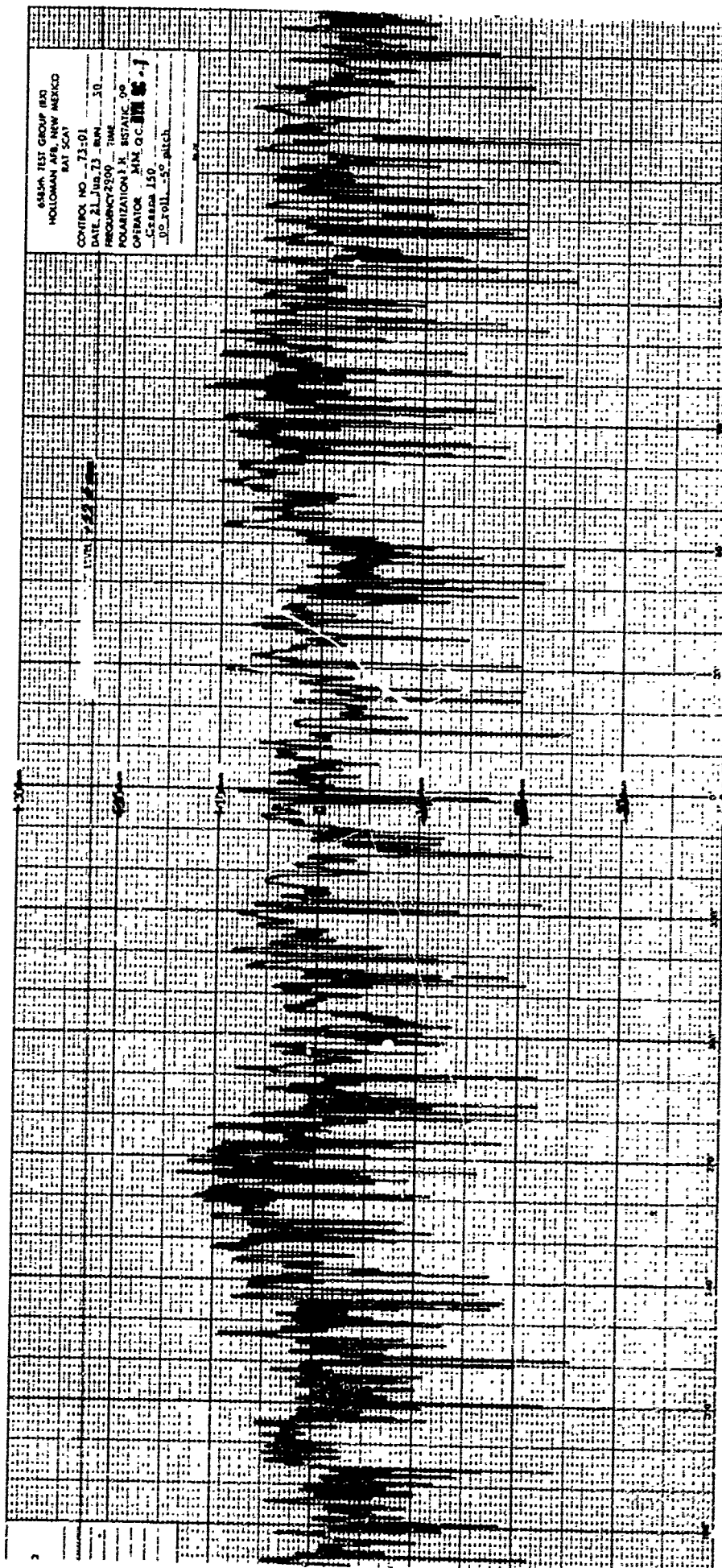
FREQUENCY 2500 TIME

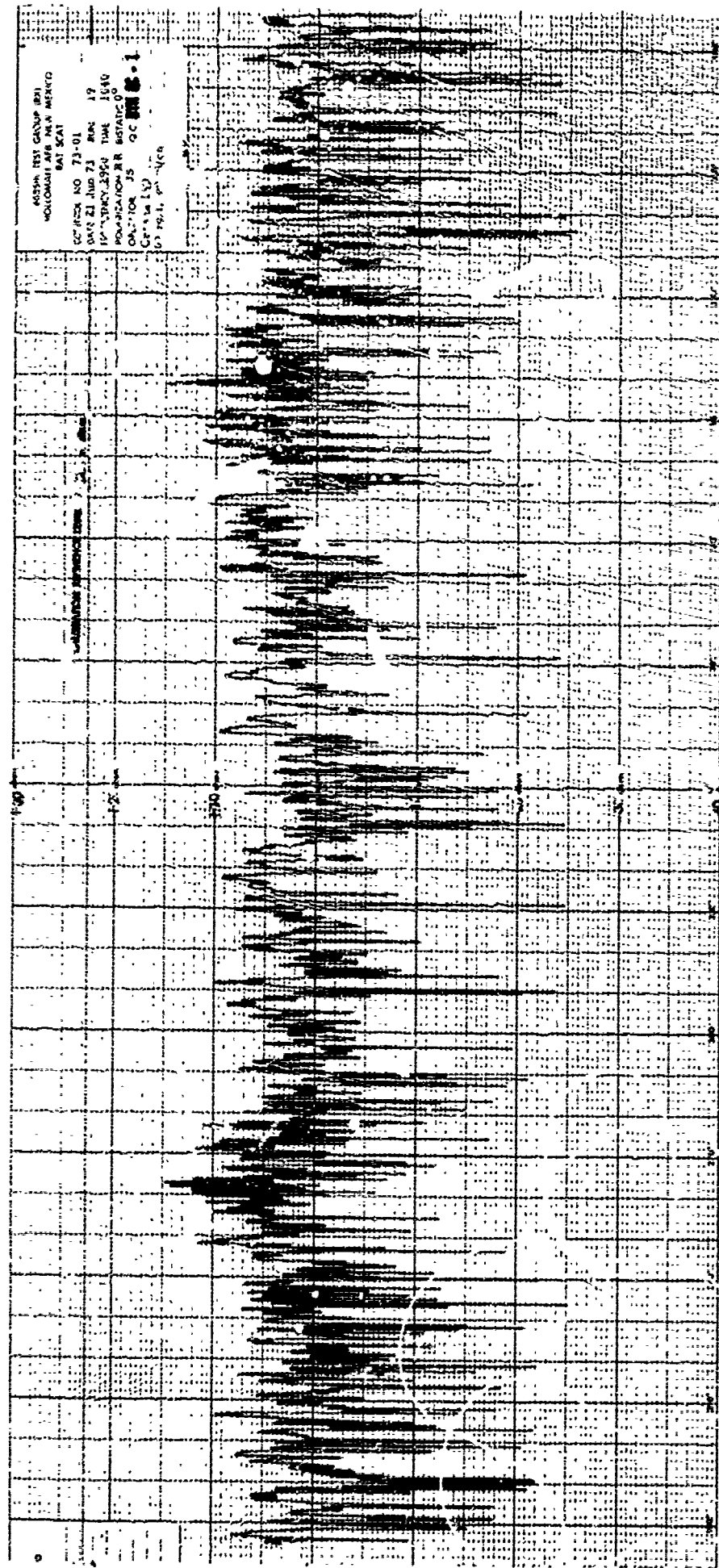
POLARIZATION 1/2 STATIC 90

OPERATOR MIM, QC 211 05.1

CRATER 150

00 roll 50 pitch





ALISHA TEST GROUP B21  
HOLCOMB AFB TEX MEXICO  
BAT SCAT  
CC RZCA NO 73-01  
DATE 21 JUN 73 TIME 19  
140000Z 2904 TIME 1540  
RCA-RCA COM R R BOSTAC 0  
ON 1708 25 OC 0000-1  
C 1413  
0 1901 1 1901



ASBMA TEST GROUP 183  
HOLCOMMAN AFB NEW MEXICO  
EXT 507

CONTROLS NO. 73-01

DATE 25 JUN 73 TIME 1459

OPERATOR MAM

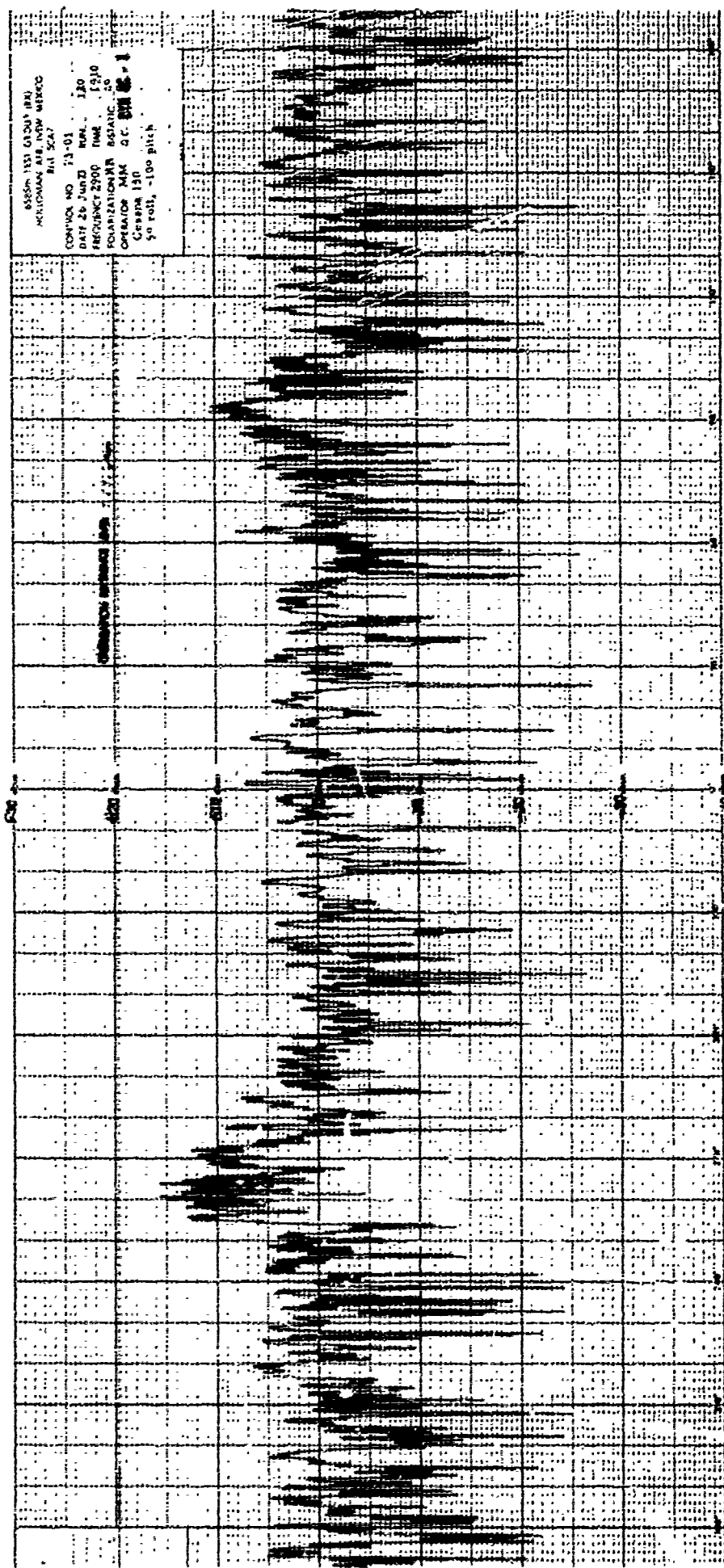
POBINATION 22 ROTARY 00

CRATER 150

PO CELL 3102 0111

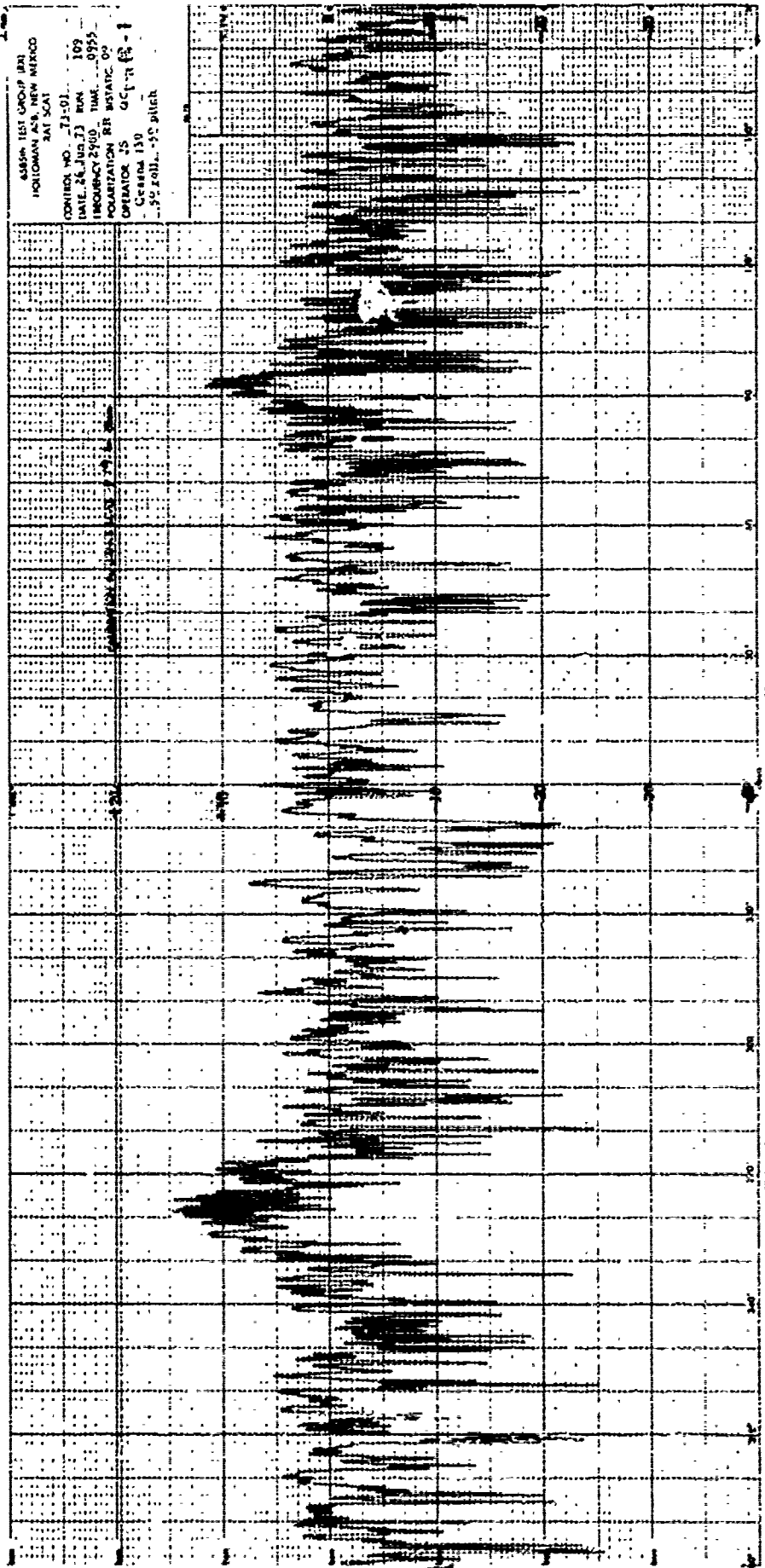
ASSON 133 01301 (R)  
MELIPAN AIR NEW MEXICO  
RIN 5A7

CONTROL NO 13-01  
DATE 26 JUN 60  
FREQUENCY 2700  
POLARIZATION R  
OPERATOR MNC G.C.  
Cassette 130  
50 Pct, -100 Pct

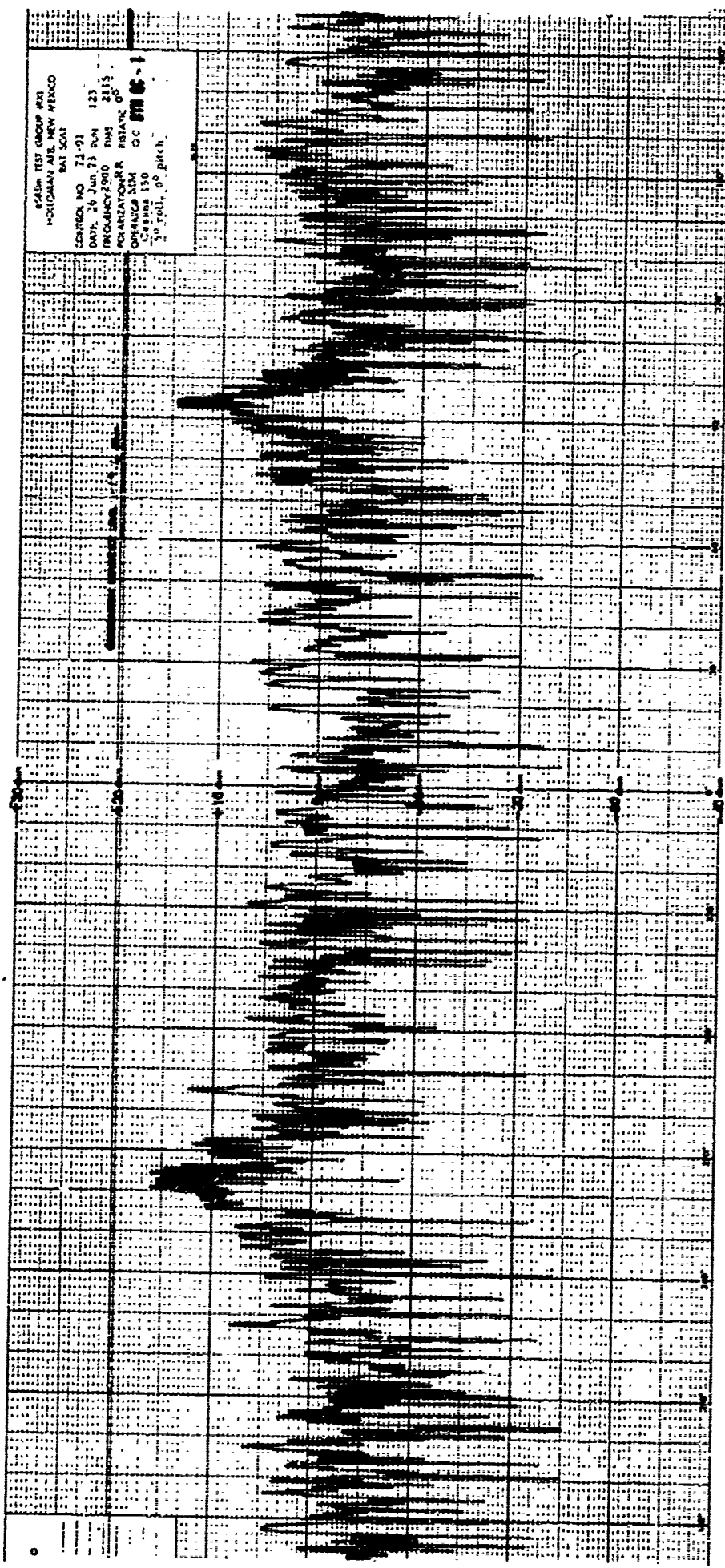




ASST. TEST GROUP (B)  
HOLMAN A.S. NEW MEXICO  
SAT SAT  
CONTROL NO. 72-01  
DATE 24 JUL 73 RUN 109  
FREQUENCY 2500 TIME 0555  
POLARIZATION R.R. M541C.00  
OPERATOR JS GC 1713-1  
- GEORGE 130 GC 1713-1  
- 55-2012-55 Allen

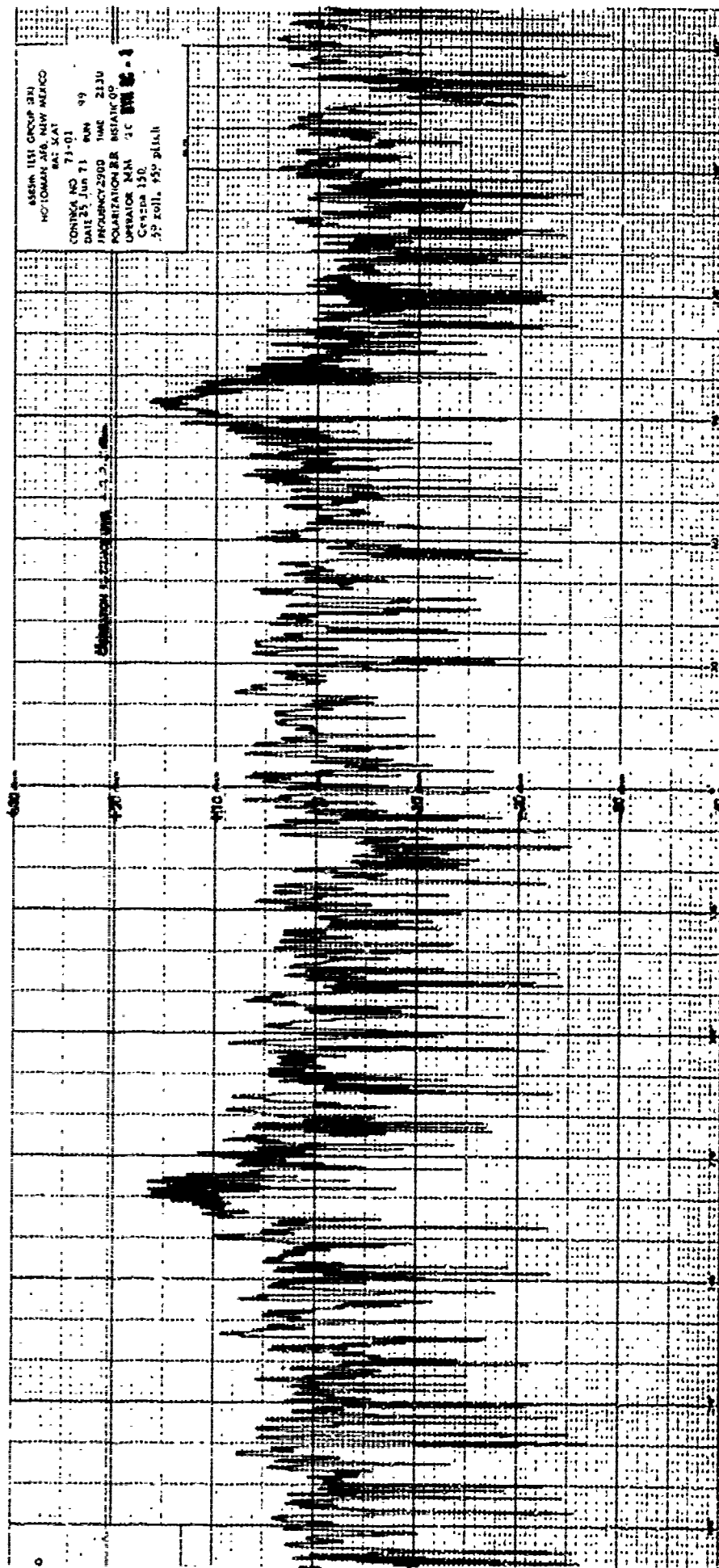


4250m TEST GROUP #21  
HOLIDAY AVE, NEW WINCO  
BAT SCAT  
CONTROL NO 21-01  
DATE 26 Jun 75 RUN 123  
FREQUENCY 500 MHz 21.5  
OPERATOR R. PRINCE  
OPERATOR NM OC 0706 05-1  
Cassini 130  
20 fold, 0° pitch



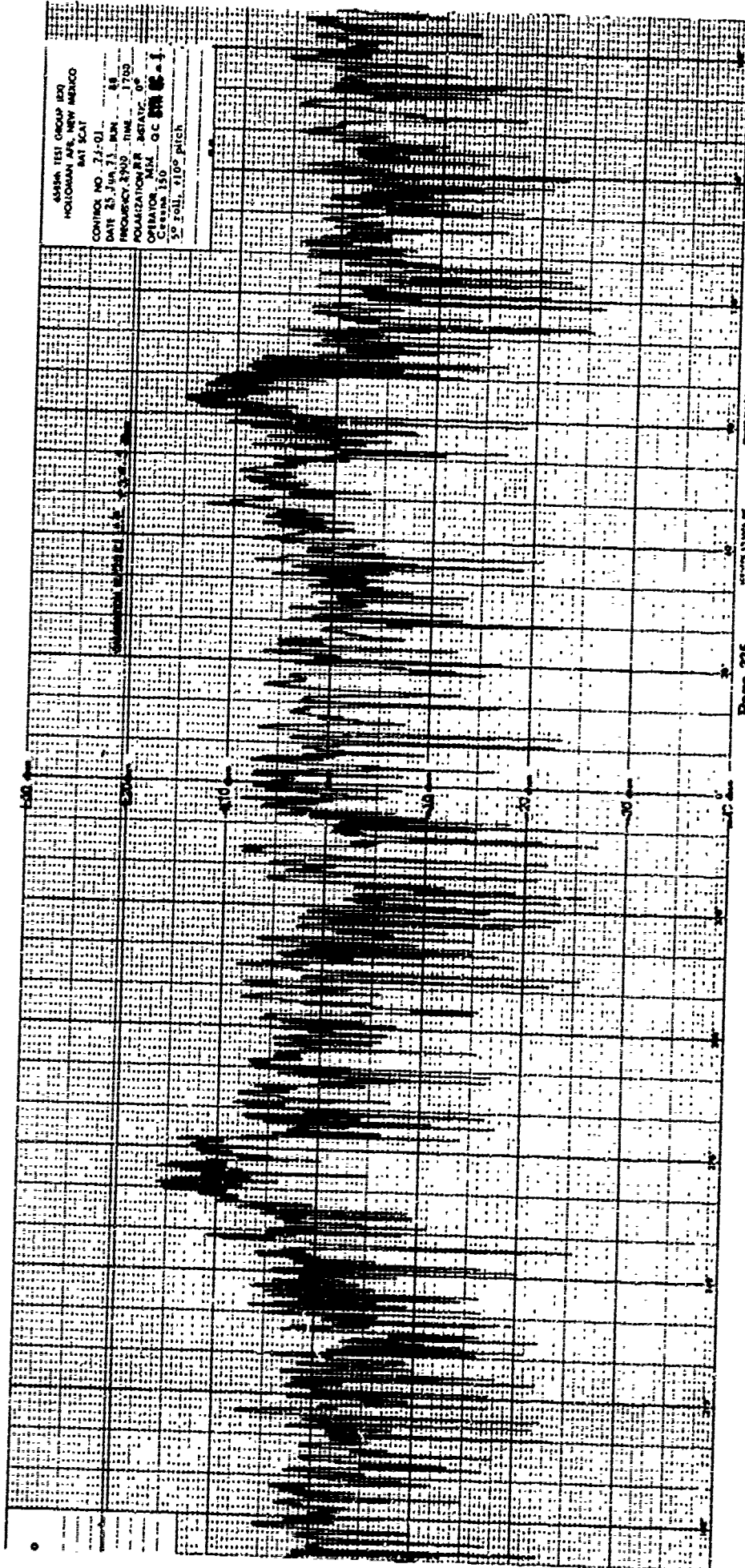


ASSTN 1151 GROUP 321  
HOTOMAN 260, NEW MEXICO  
BAT SCAT  
CONTING NO 73-01  
DATE 25 Jun 71 04M 49  
INSTRUMENT 2000 TMC 2230  
POLARIZATION 2R INSTANT CO  
OPERATOR KIN JC BWA 2-1  
CRATER 150  
30 KOLL 450 pluck

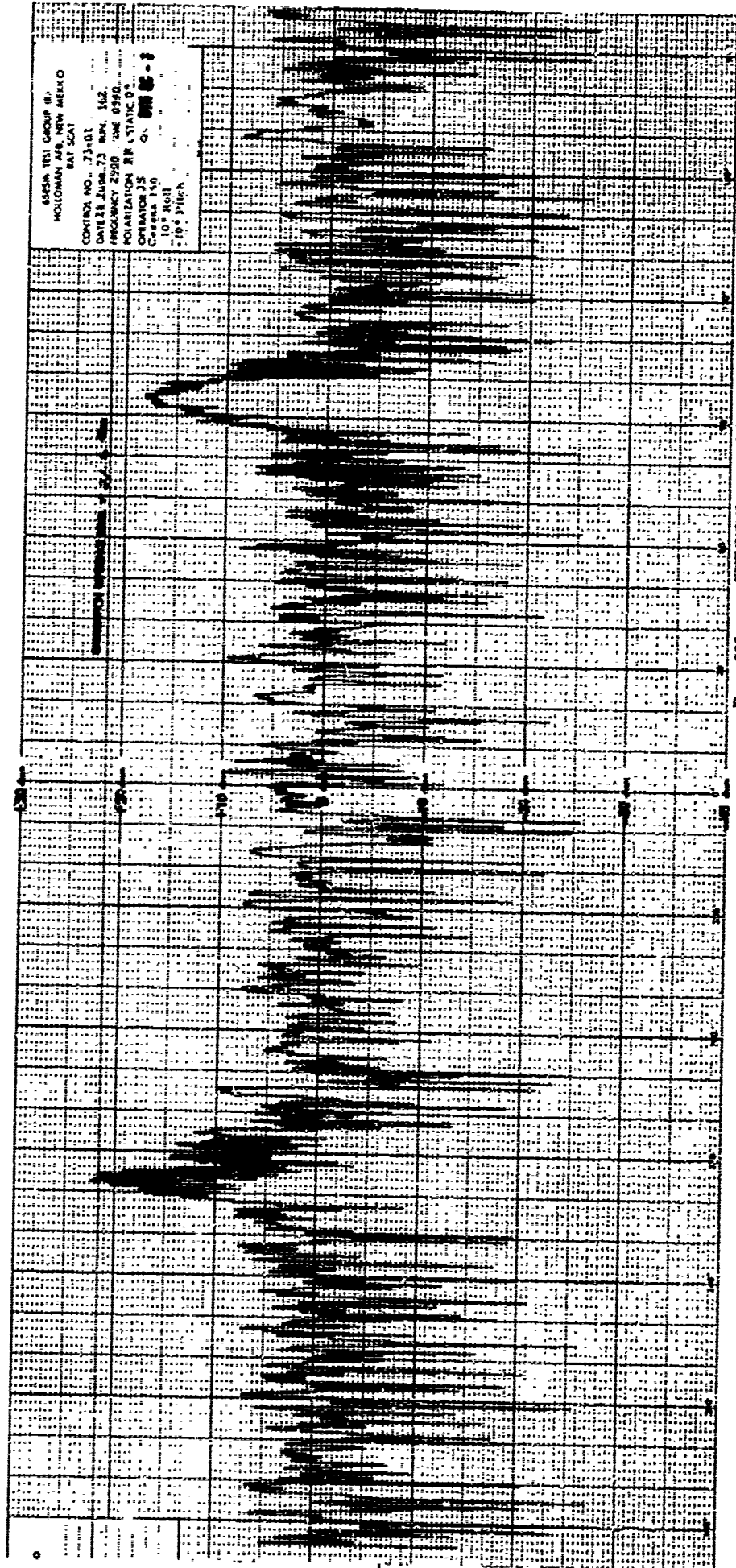


ASSIN TEST GROUP 220  
HOLLOMAN AVE, NEW MEXICO  
BAT SCAT

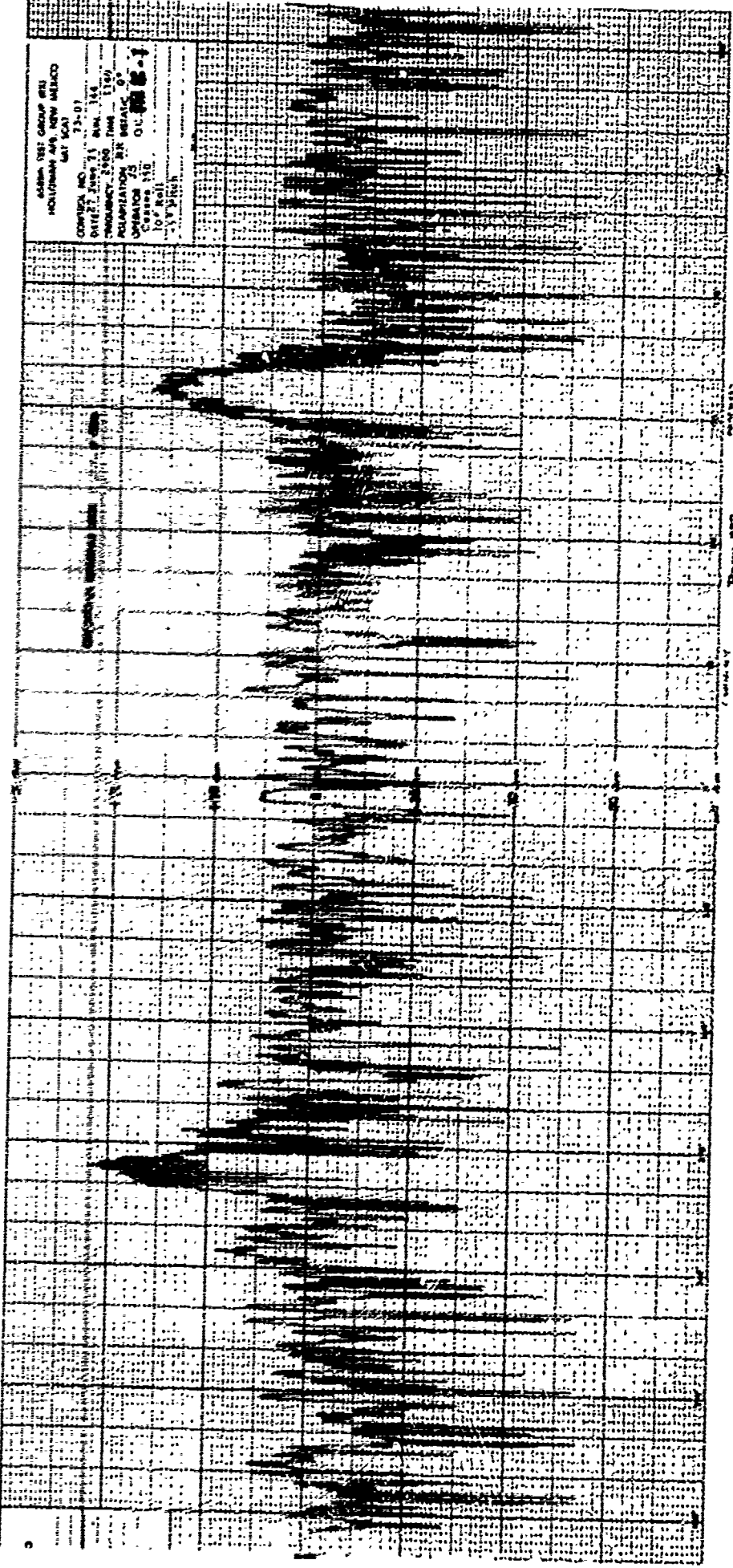
CONTROL NO. 24-01  
DATE 25 JUN 71  
FREQUENCY 2500 MHz  
POLARIZATION RH  
OPERATOR MIA  
CIRCUIT 150 GC 220-1  
1000 1100 PICH



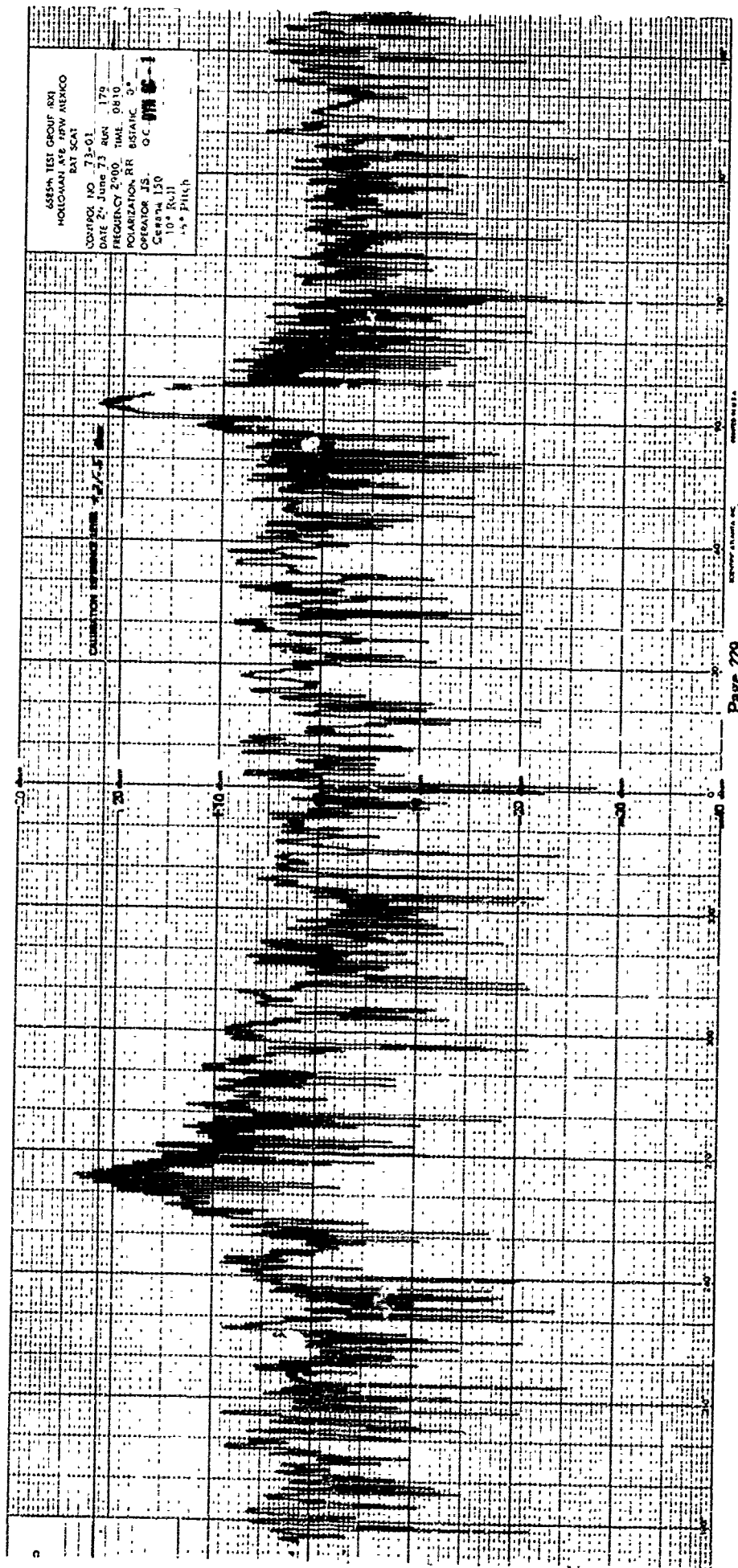
6555A TEST GROUP (B)  
HOLCOMB AFB, NEW MEXICO  
BAT SCAT  
CONTROL NO. 73-01  
DATE 28 June 73 RUN 162  
FREQUENCY 2500 MC 0350  
POLARIZATION R/R STATIC 0°  
OPERATOR JS  
Cassette 140  
10° Roll  
-10° Pitch



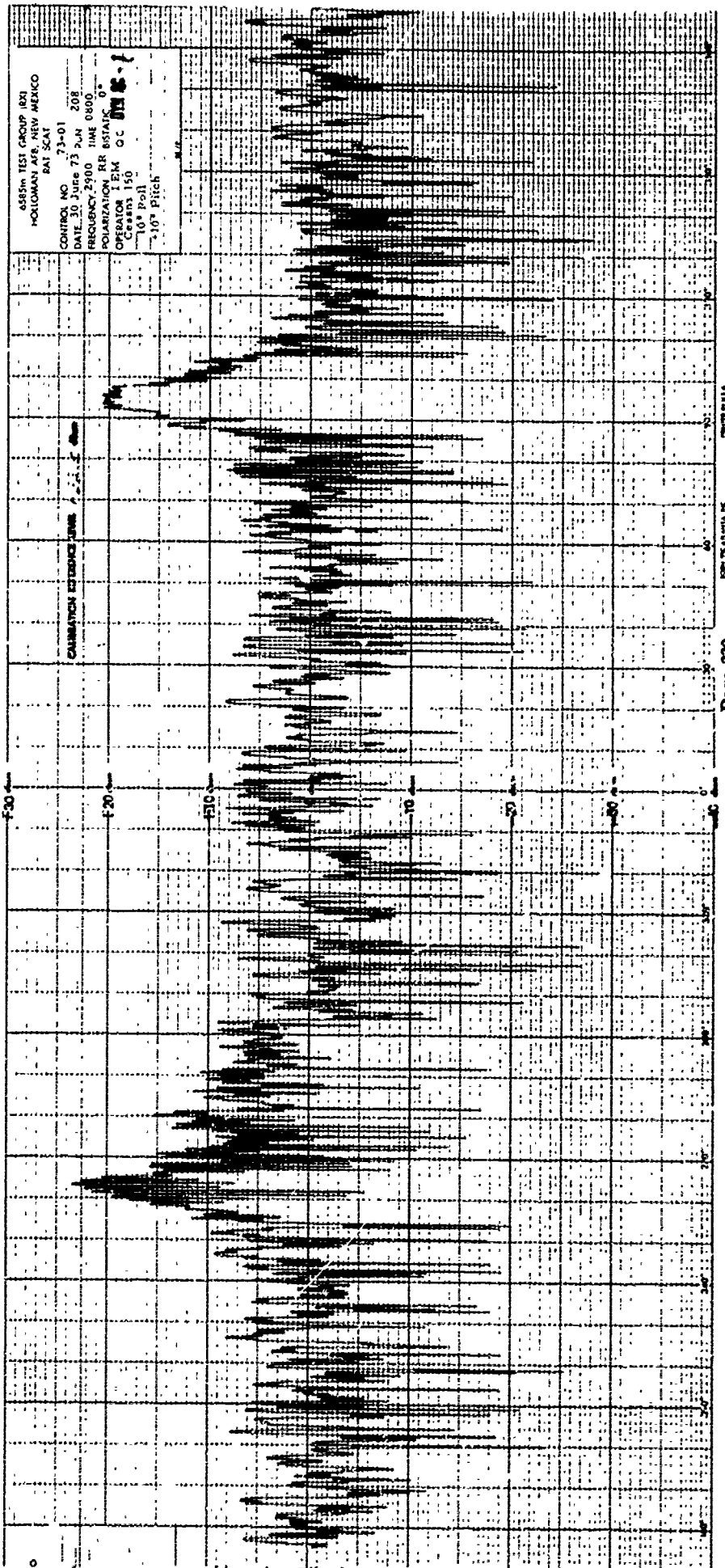
ARMED TEST GROUP 881  
HOL/PHAN 445 NEW MEXICO  
LAT 34.1  
CONVEX NO. 73-01  
011277 Zulu 71 445 145  
FREQUENCY 2500 Hz 1150  
REGISTRATION AIR METRIC 0  
OPERATOR 75  
Crew 150  
10' ball  
10' ball



AVENUE TEST GROUP 121  
MILITARY APT. NEW MEXICO  
BAT 501  
COPPER 10 12101  
DATE 25 12101 121  
PUNISHMENT 12101  
PUNISHMENT 12101  
OPERATOR 12101  
100 12101  
12101











ASBIA TEST GROUP WVI  
HOLLOMAN AIRFIELD NEW MEXICO  
BAT SCAT

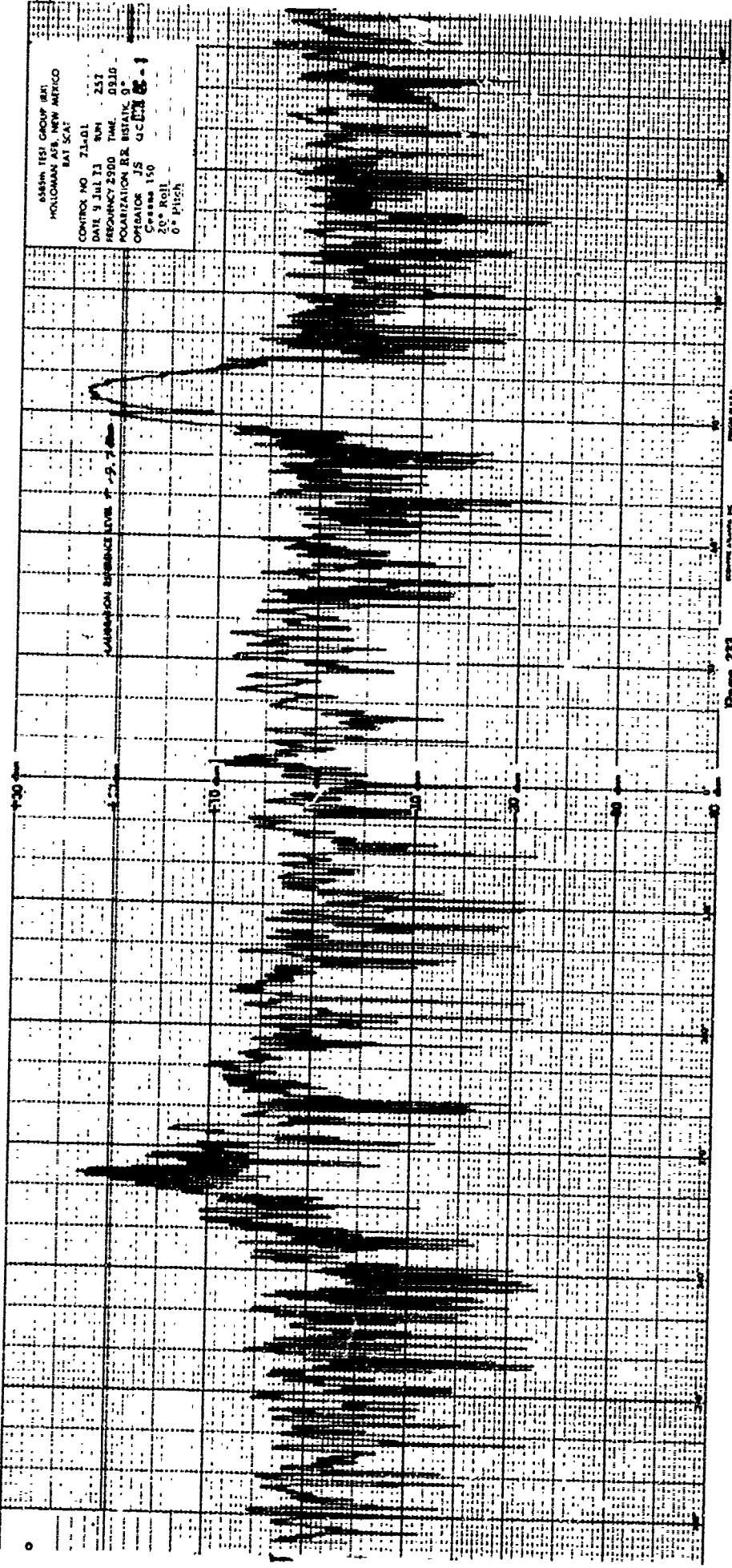
CONTROL NO 71-01  
DATE 12 Jul 73 2:00 1015  
FREQUENCY 2900 TIME 1015  
POLARIZATION R/R BSTAT 0°  
OPERATOR JS OC 0710-1  
Cassius 150  
20° Roll  
-5° Pitch

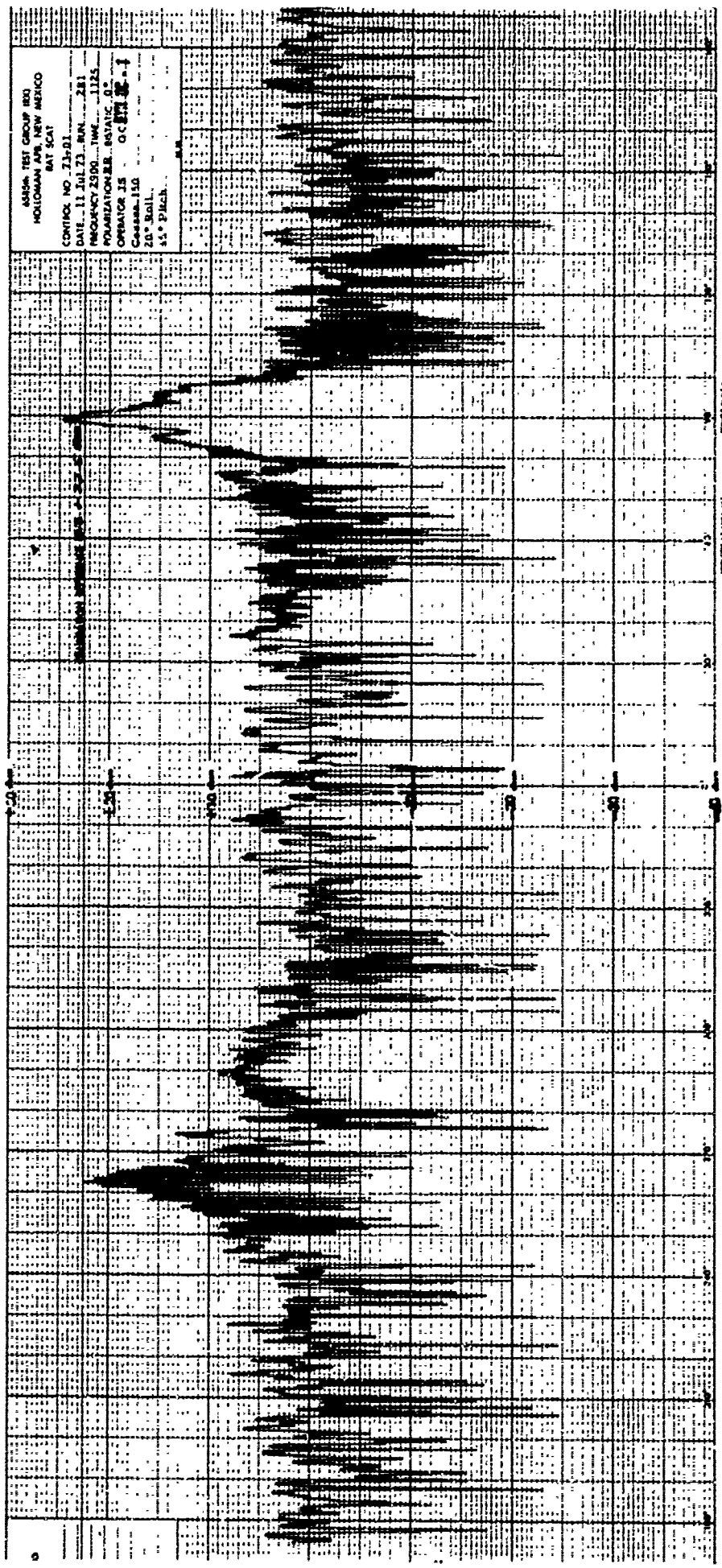
REMARKS: 1015-1020

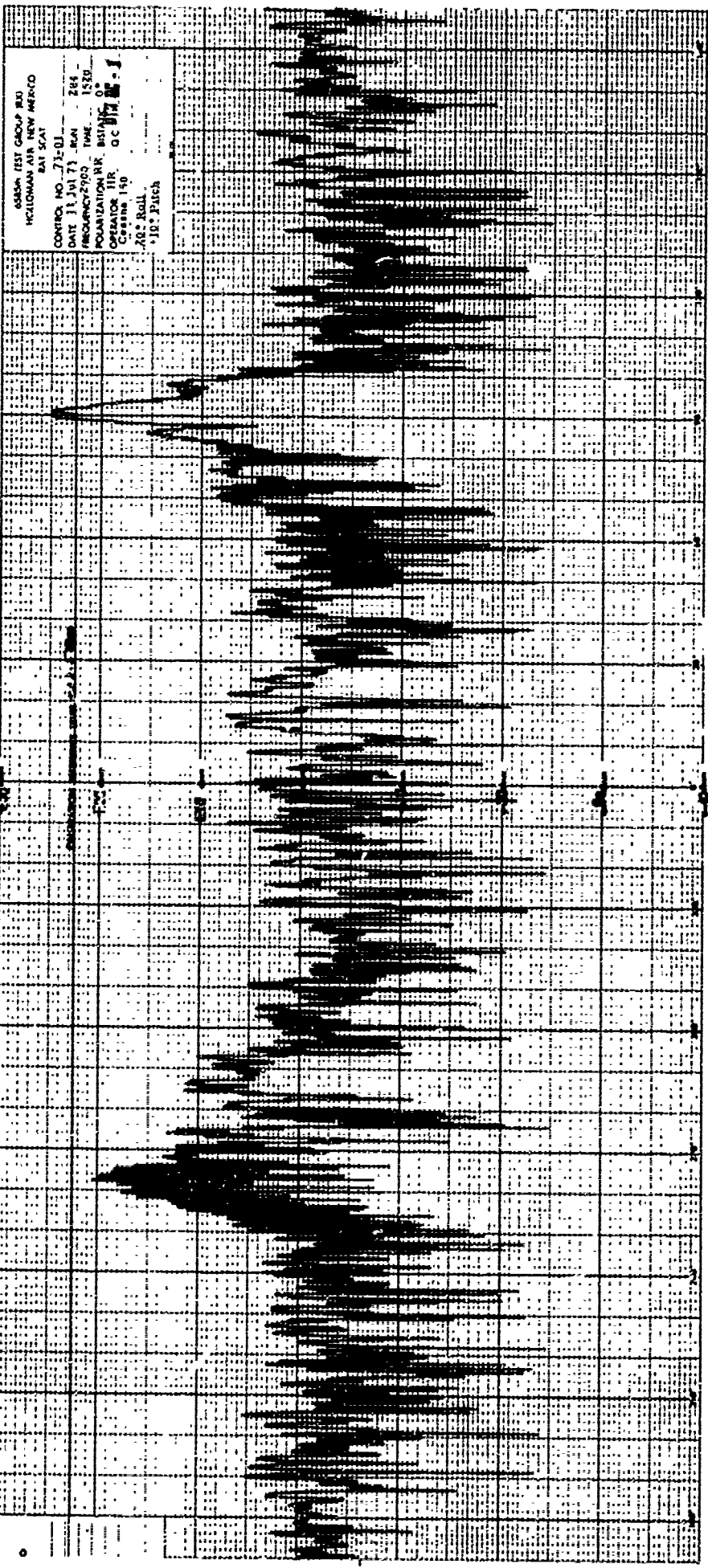
ASSEM TEST GROUP (AT)  
HOLLOMAN AFB, NEW MEXICO  
BAT SCAT

CONTROL NO 71-01  
DATE 9 Jul 73 804 237  
FREQUENCY 2900 MHz 0310  
POLARIZATION RH HORIZONTAL  
OPERATOR JS GCHB 05-1  
Scales 150  
EC Roll  
0° Pitch

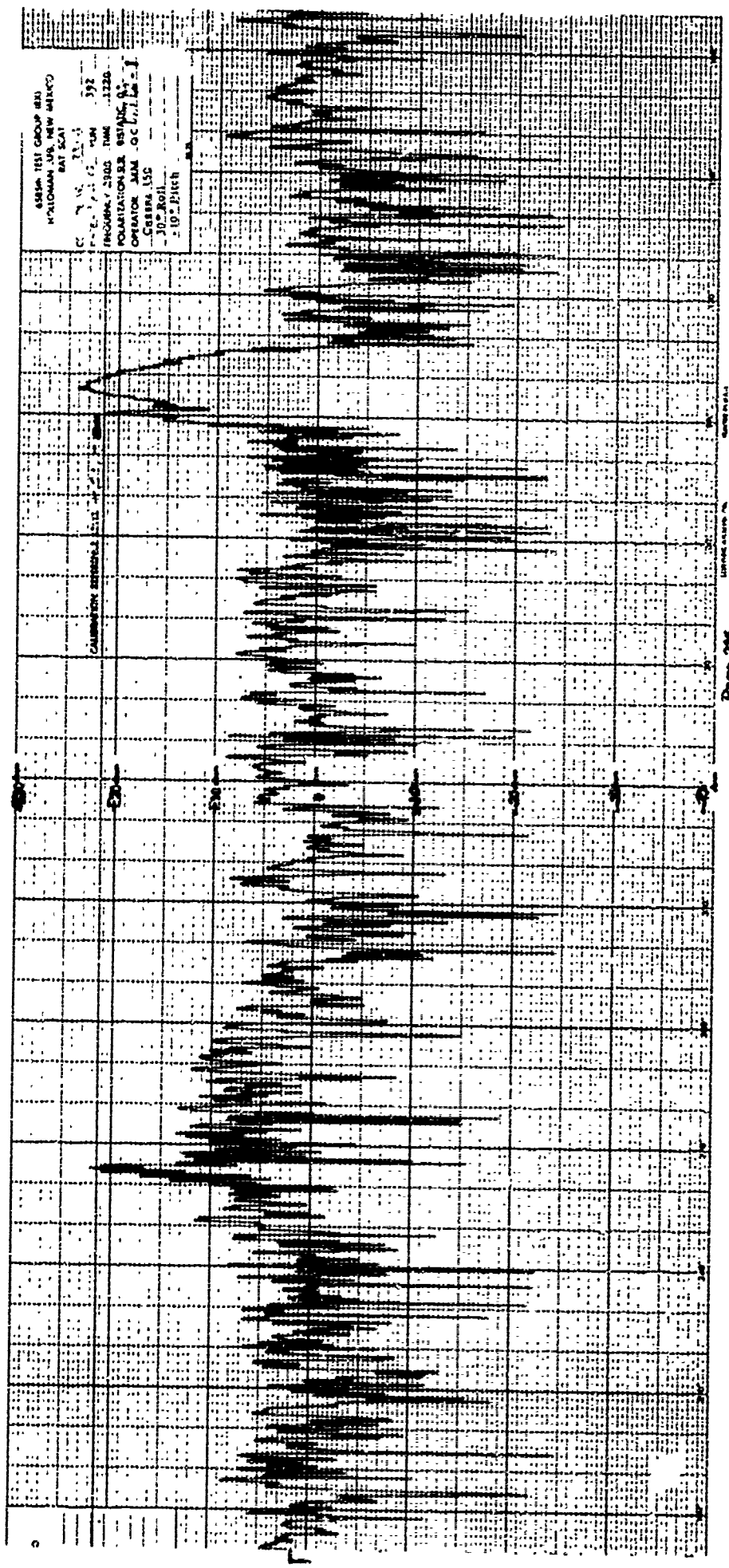
LAUNCH ON URGENCY LIVE AT 9:40



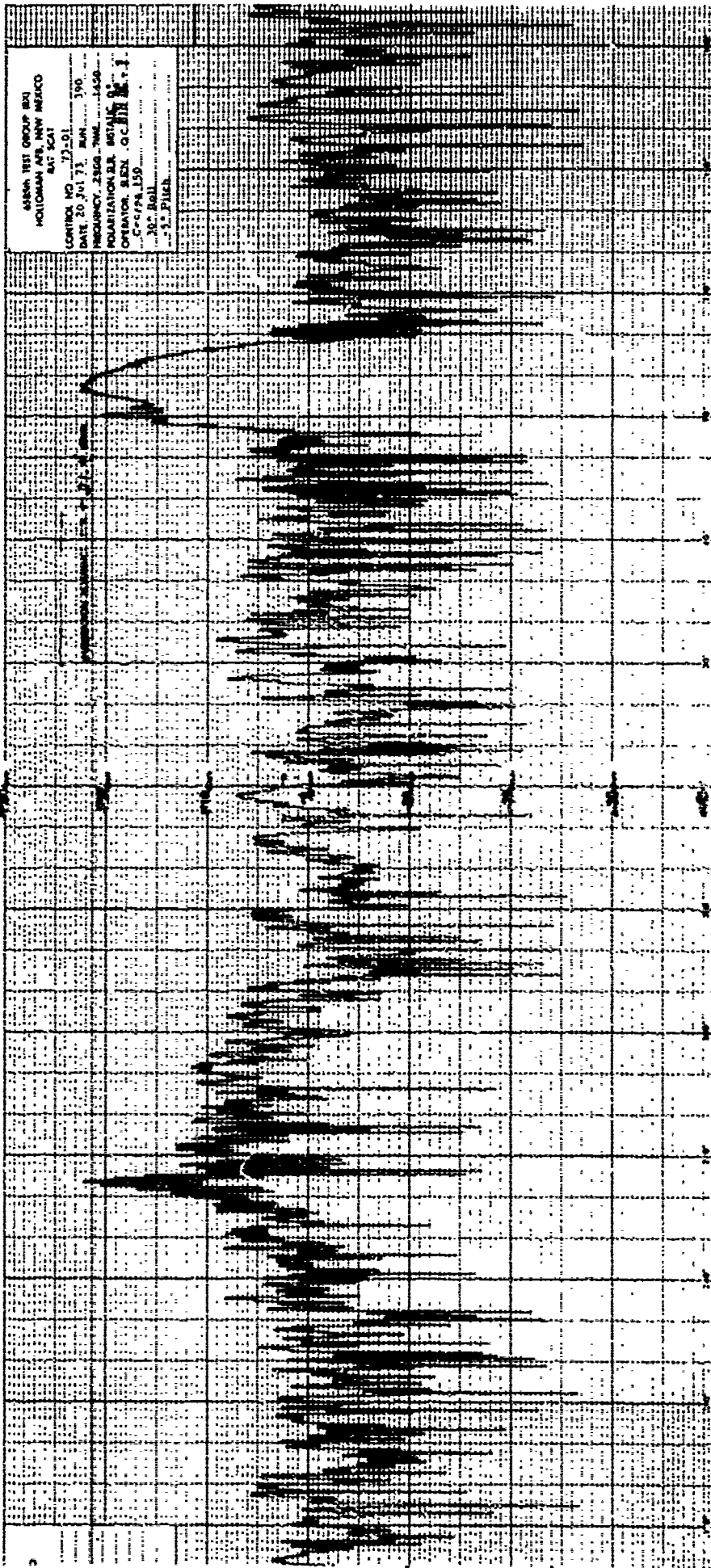




6454A TEST GROUP 821  
 MCDONNELL, JON NEW MEXICO  
 SAT SAT  
 CT 7 15 33 392  
 INCHES / 2100 TIME 1120  
 POLARIZATION BY STAINING  
 OPERATOR MM OC [unclear]  
 CARRIAGE  
 30° Roll  
 2 10° Pitch

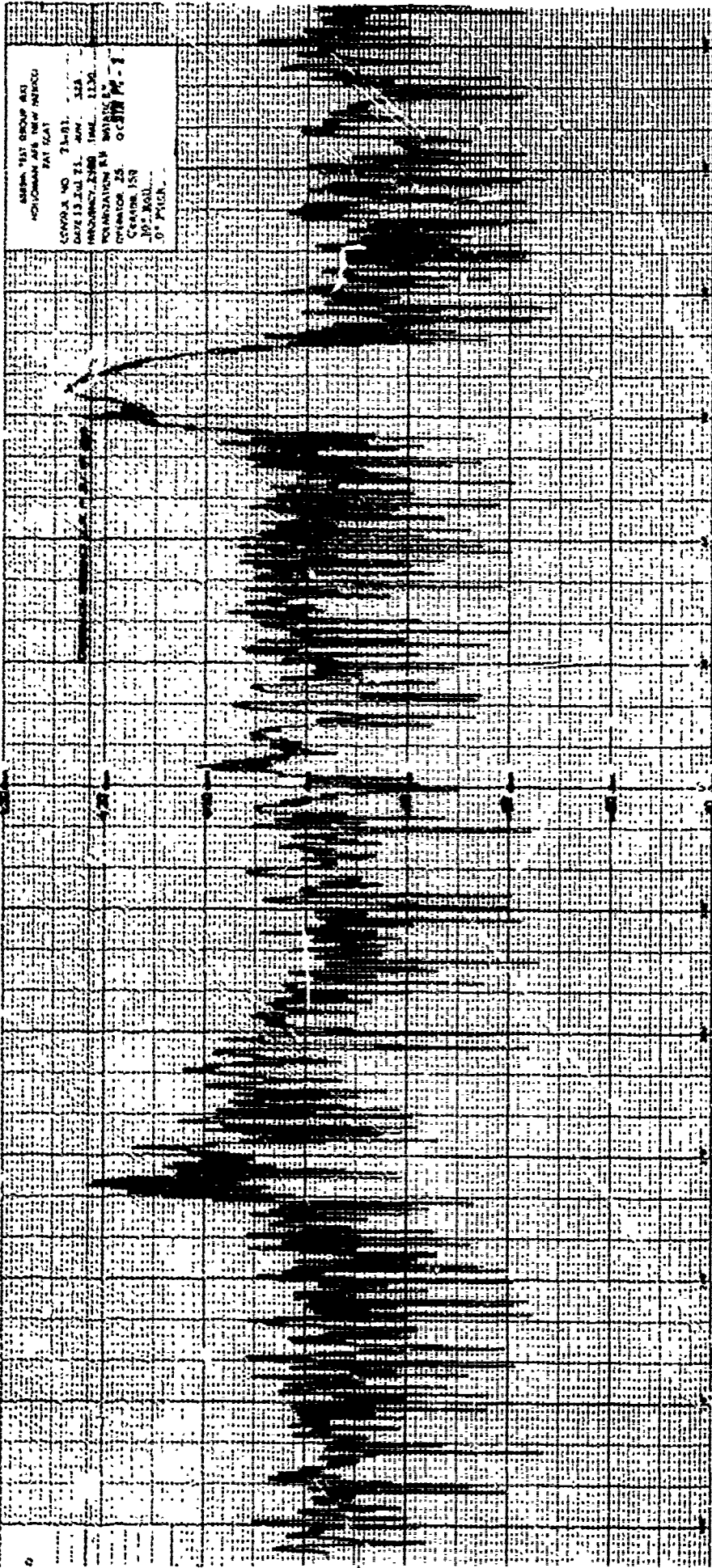






ASISPA TEST GROUP BX1  
HOLCOMMAN AVE, NEW MEXICO  
BAT SCAT

CONTROL NO. 72-01  
DATE 20 JUL 73 RUN 190  
INTEGRITY ZUGG NAME 1400  
POLARIZATION 2.8 ROTATION 0.5  
OBSERVER SEN. G.C. 111 11.1  
C-CPA 150  
30" Bell  
1" Pitch



ASPER 1517 GROUP 810  
HORIZONTAL AND VERTICAL INTERO  
FOR 1517

CONVEX NO 71-81  
DATE 13 JUL 71 AM 11:30  
HORIZONTAL 2100 INCH 11:30  
POSITIONATION BY SURVEY  
ELEVATION 25 0.810 M-1  
CREATOR 159  
100' MOLL  
0° PUGH

38854 TEST GROUP 871  
HOLCOMB AFB, NEW MEY, LO  
BAT SCAT

CONTROL NO 71-01  
DATE 13 JUL 73 JUN 325  
FREQUENCY 2700 TIAL 7335  
POLARIZATION R/R BRYANS 0°  
OPERATOR JS - OCEAN 10-1  
Cassara 50  
10° Roll  
+5° Pitch

38854 TEST GROUP 871  
HOLCOMB AFB, NEW MEY, LO  
BAT SCAT

CONTROL NO 71-01  
DATE 13 JUL 73 JUN 325  
FREQUENCY 2700 TIAL 7335  
POLARIZATION R/R BRYANS 0°  
OPERATOR JS - OCEAN 10-1  
Cassara 50  
10° Roll  
+5° Pitch



ADAMS TEST GROUP 820  
HOLLOMAN AFB, NEW MEXICO  
B-1 B-1

CONTROL NO. 23-21  
DATE 23 JUN 79  
FREQUENCY 220 MHz  
POLARIZATION R.E. BR/115  
OPERATOR R.E. BR/115  
CROSS 150  
10.1 Mail  
110.5 P10.5

48866 TEST GROUP 512  
HOLLAND AIR NEW MEXICO  
BAT CAT

CONTROL NO 11-11

DATE 11-11-11

REMARKS 11-11-11

OPERATION 11-11-11

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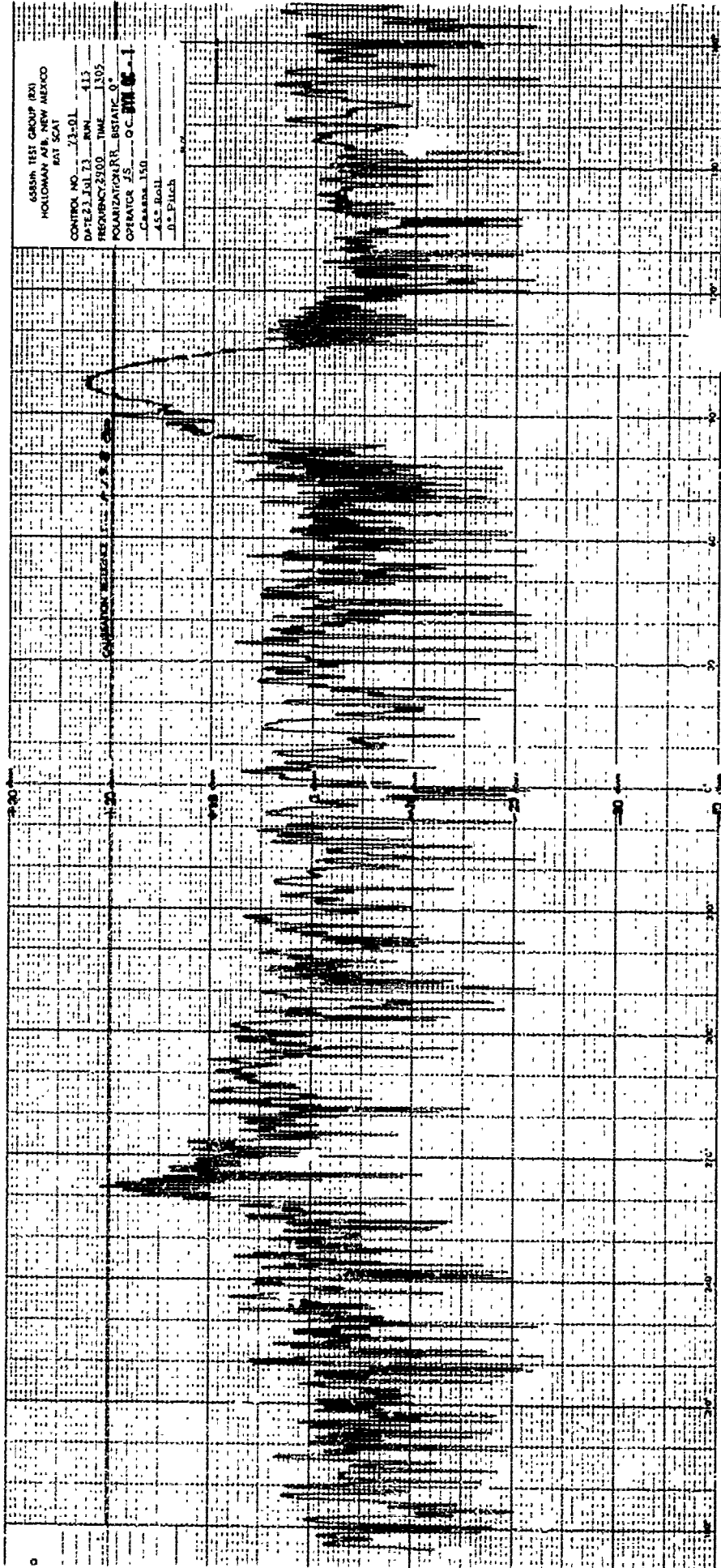
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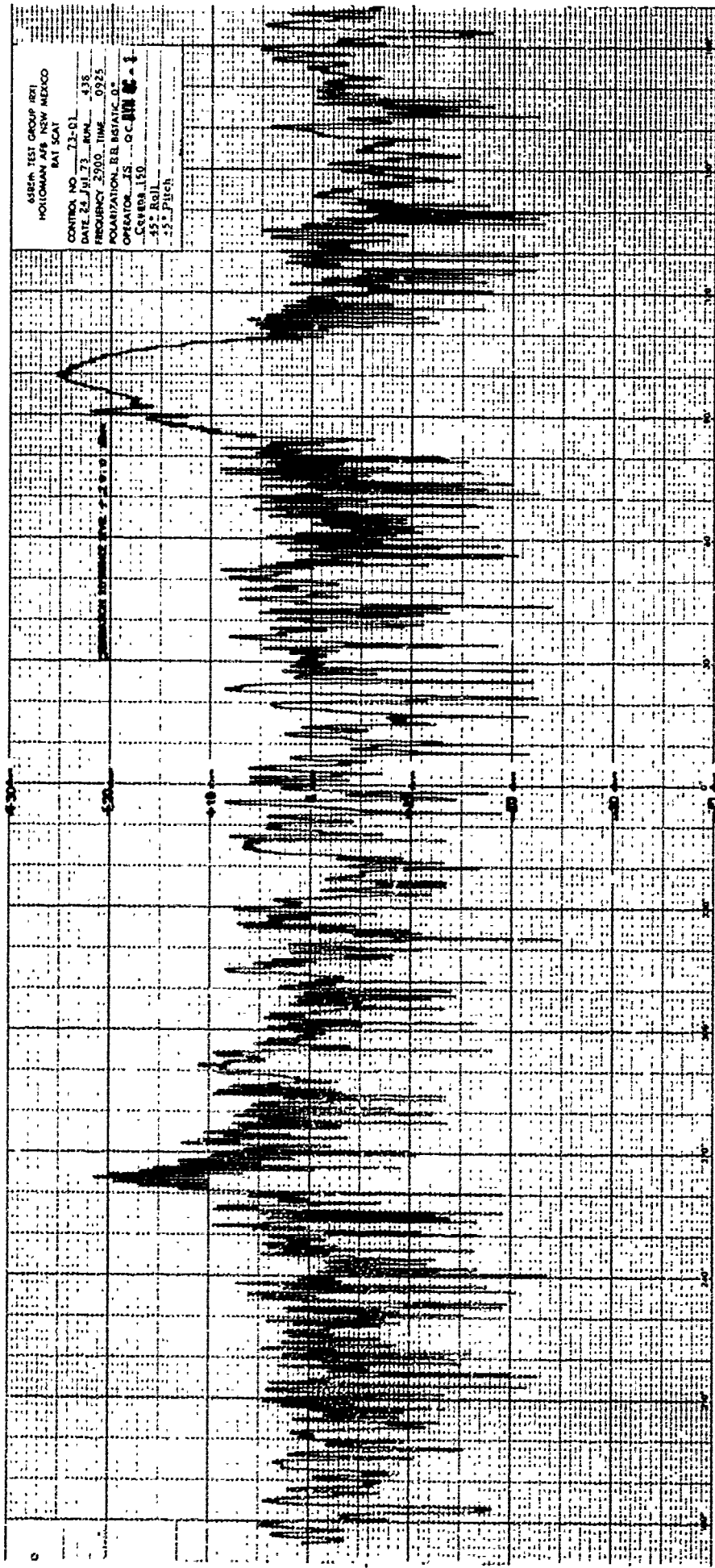
CRYSTAL NO. 23-91  
 DATE 27. Jul 73  
 FREQUENCY 2300 MHz  
 REGISTRATION B.R. 0418  
 OPERATOR JY 0000-4  
 5000150  
 4000000  
 1000000  
 1000000

1-800-233-8888



ASSTA TEST GROUP R01  
HOLMAN 448 NEW MEXICO  
BAT SCAT

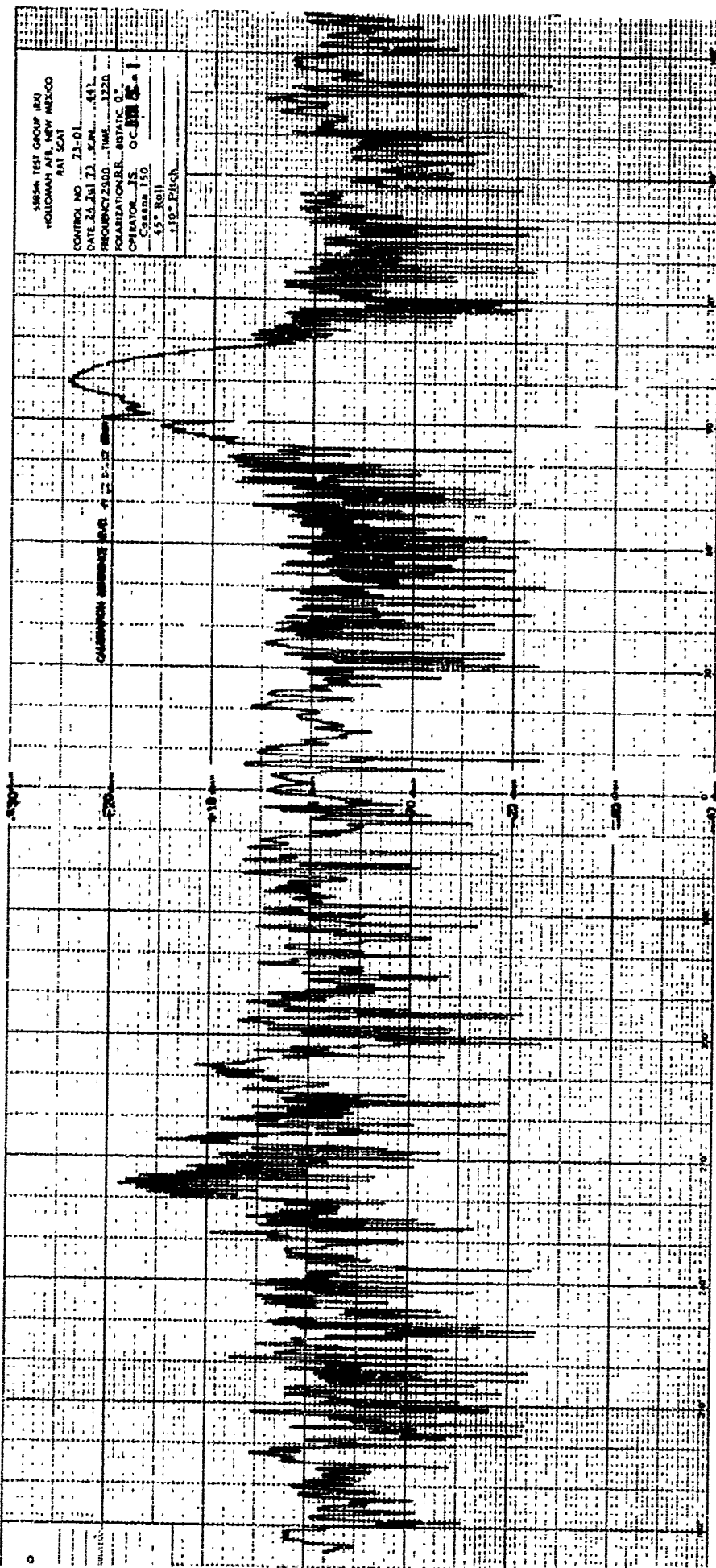
CONTROL NO 73-01  
DATE 24 JUL 73 RUN 438  
FREQUENCY 2500 TIME 0925  
POLARIZATION R.R. BISTATIC 0°  
OPERATOR JS GC.BUN 00-1  
Camera 150  
45° Roll  
25° Pitch

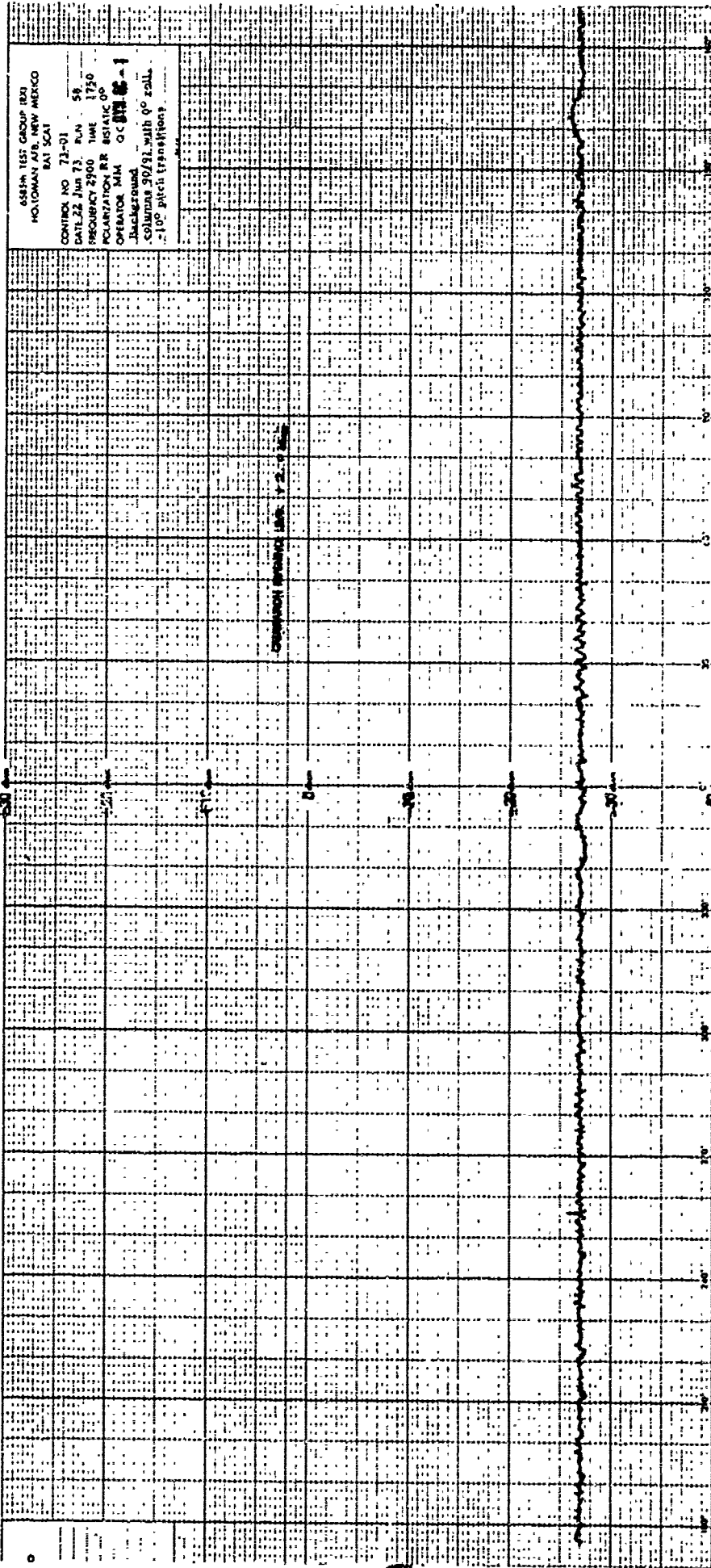


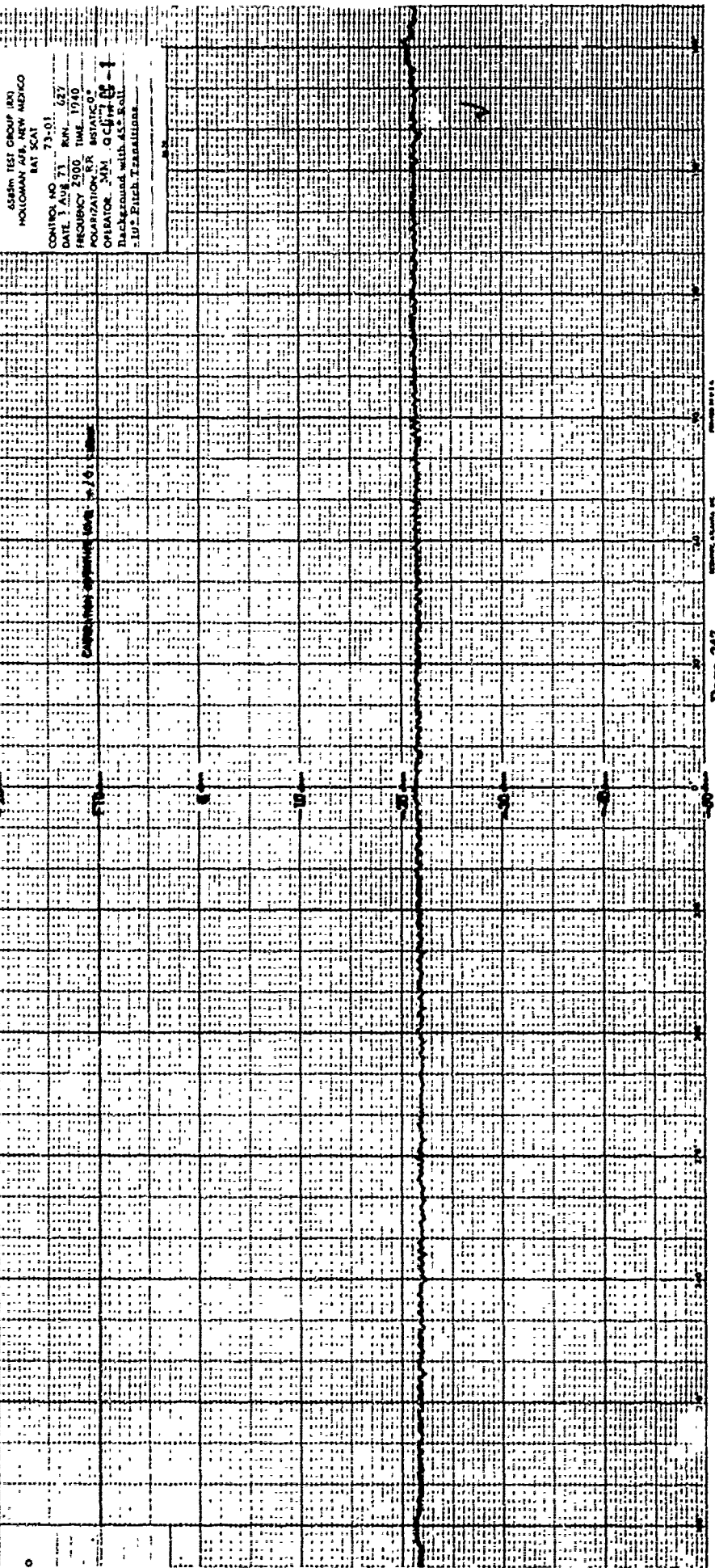


53854N TEST GROUP 1BX)  
HOLLAND AFB, NEW MEX-CO  
RAT SCAT

CONTROL NO. 72-01  
DATE 24 Jul 72 EUN 441  
FREQUENCY 2900 TIME 1220  
POLARIZATION R. STATIC 0°  
OPERATOR JS OC 0105-1  
Cassia 150  
45° Roll  
+10° Pitch

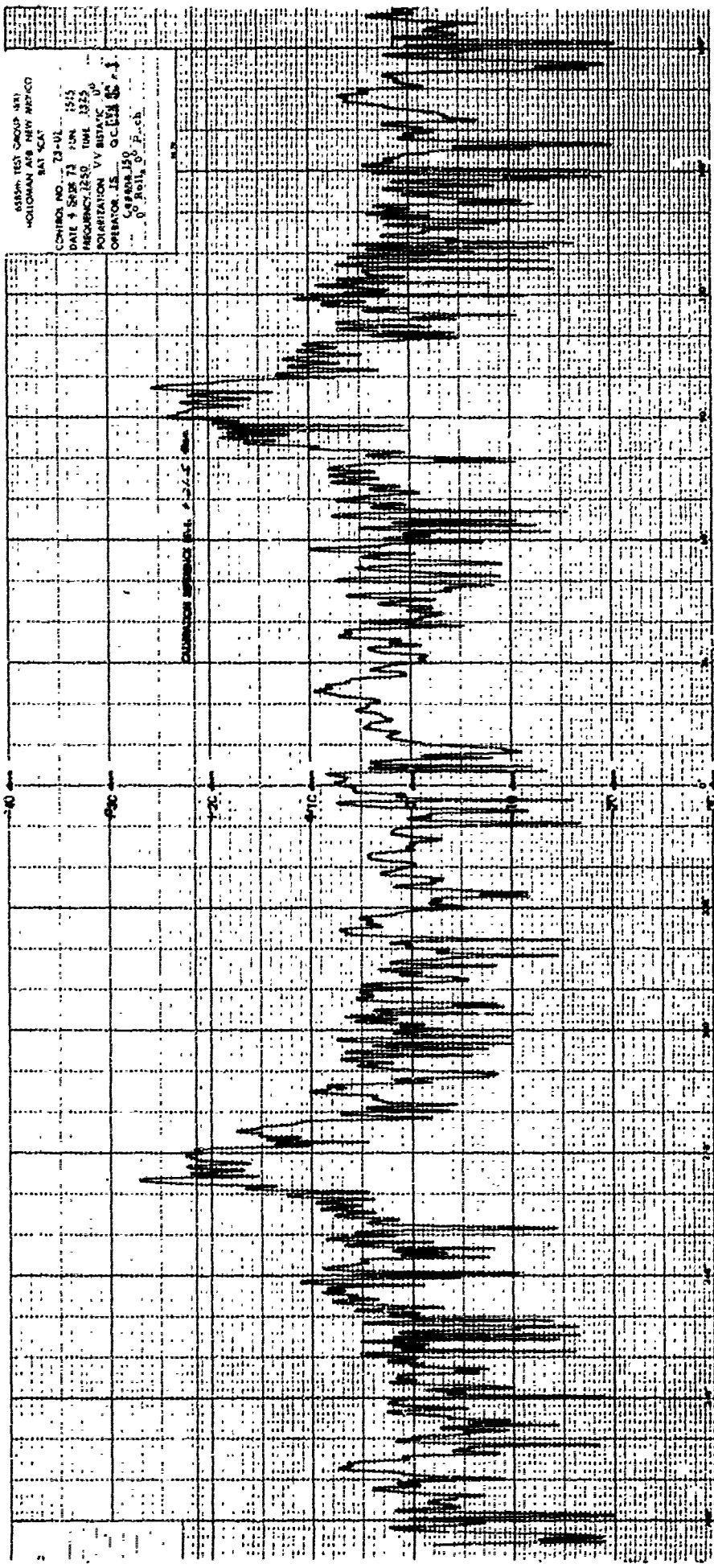


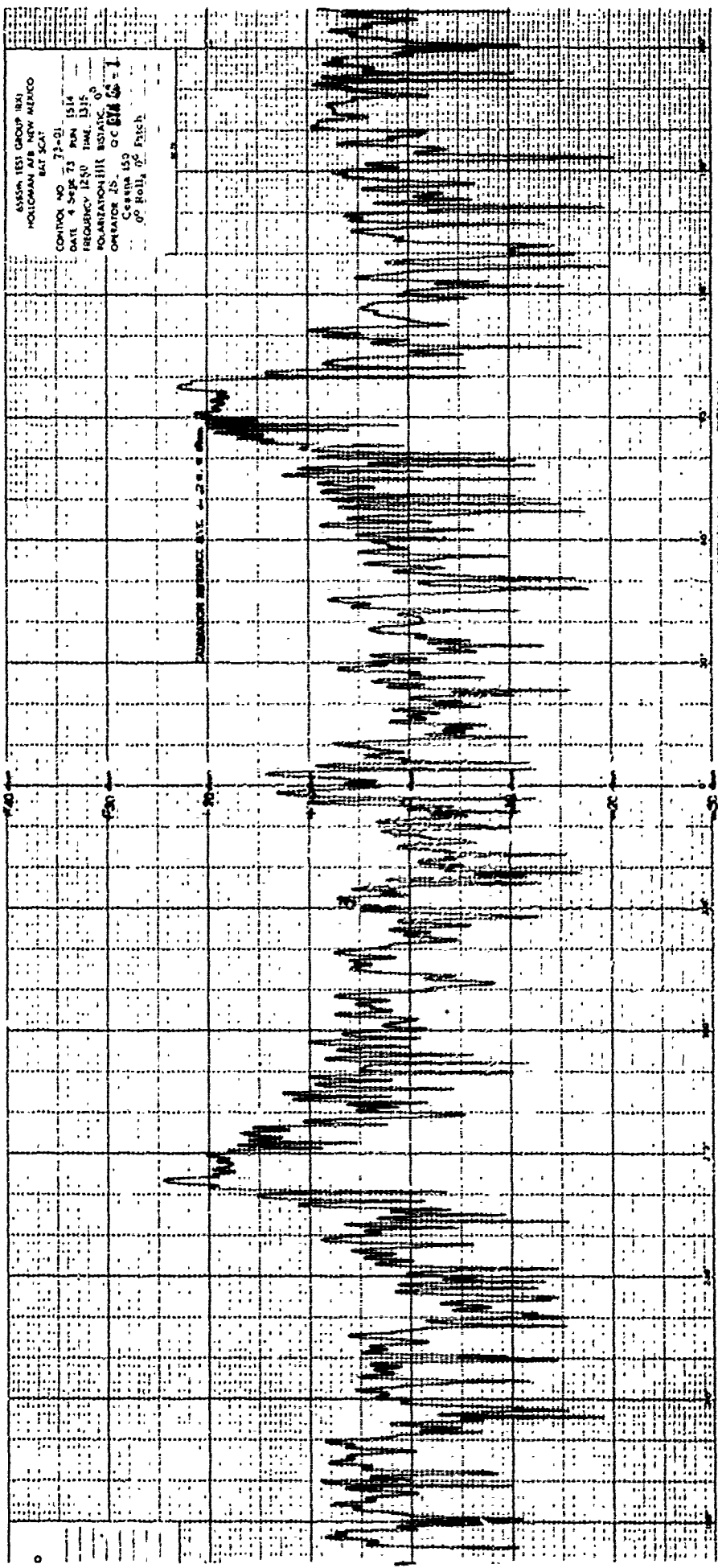




5555M TEST GROUP (X)  
HOLLOWAY AFB, NEW MEXICO  
BAT SCAT  
CONTROL NO. 73-01  
DATE 1 AUG 71 RUN 627  
FREQUENCY 2000 TIME 1940  
POSITIONER R.R. BRATKOV  
OPERATOR NIM G 0472 00-1  
Background with 455 Roll  
-10° Pitch Transitions







ASSHA TEST GROUP (RT)  
HOLLOMAN AFB NEW MEXICO  
BAT SCAT

CONTROL NO. 73-01

DATE 7 SEP 73 RUN 1345

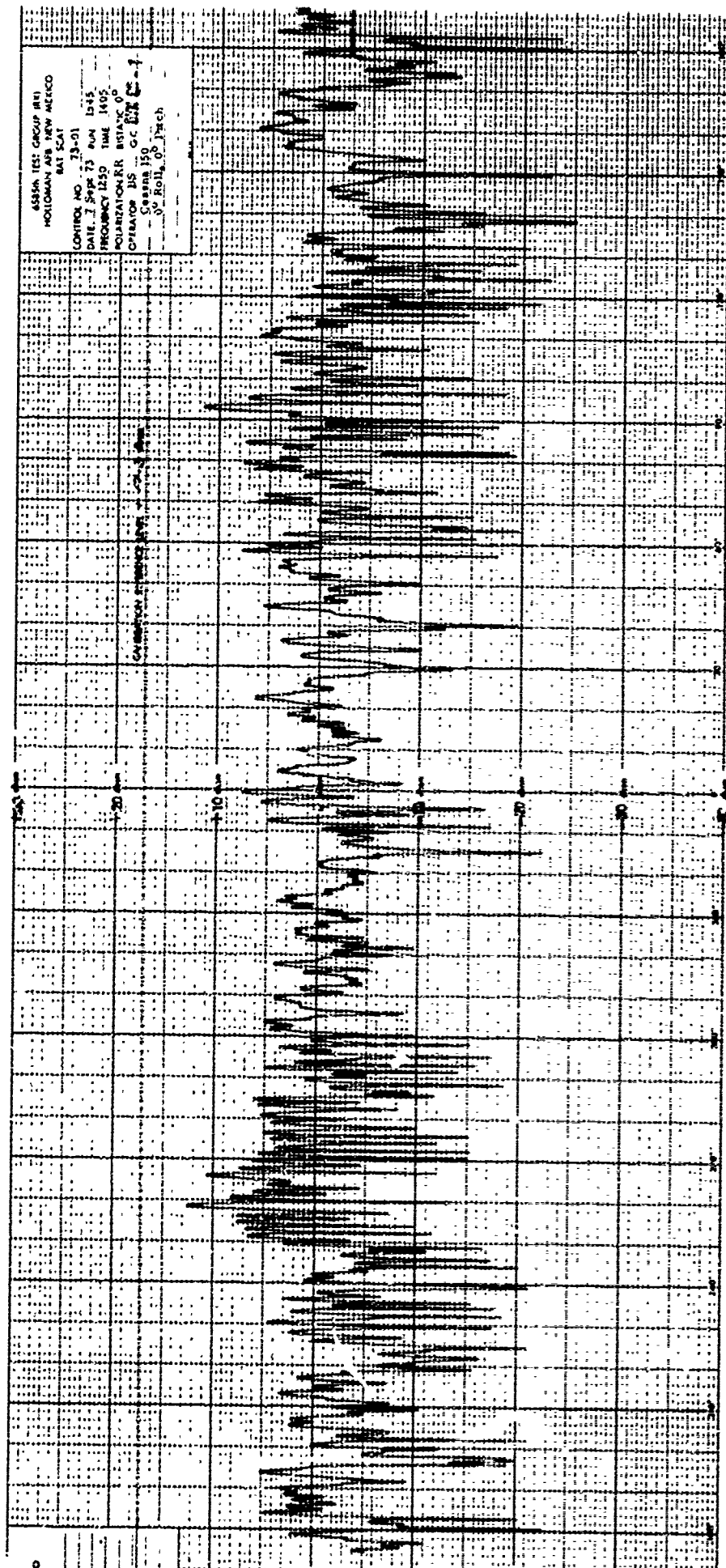
FREQUENCY 1250 TIME 1405

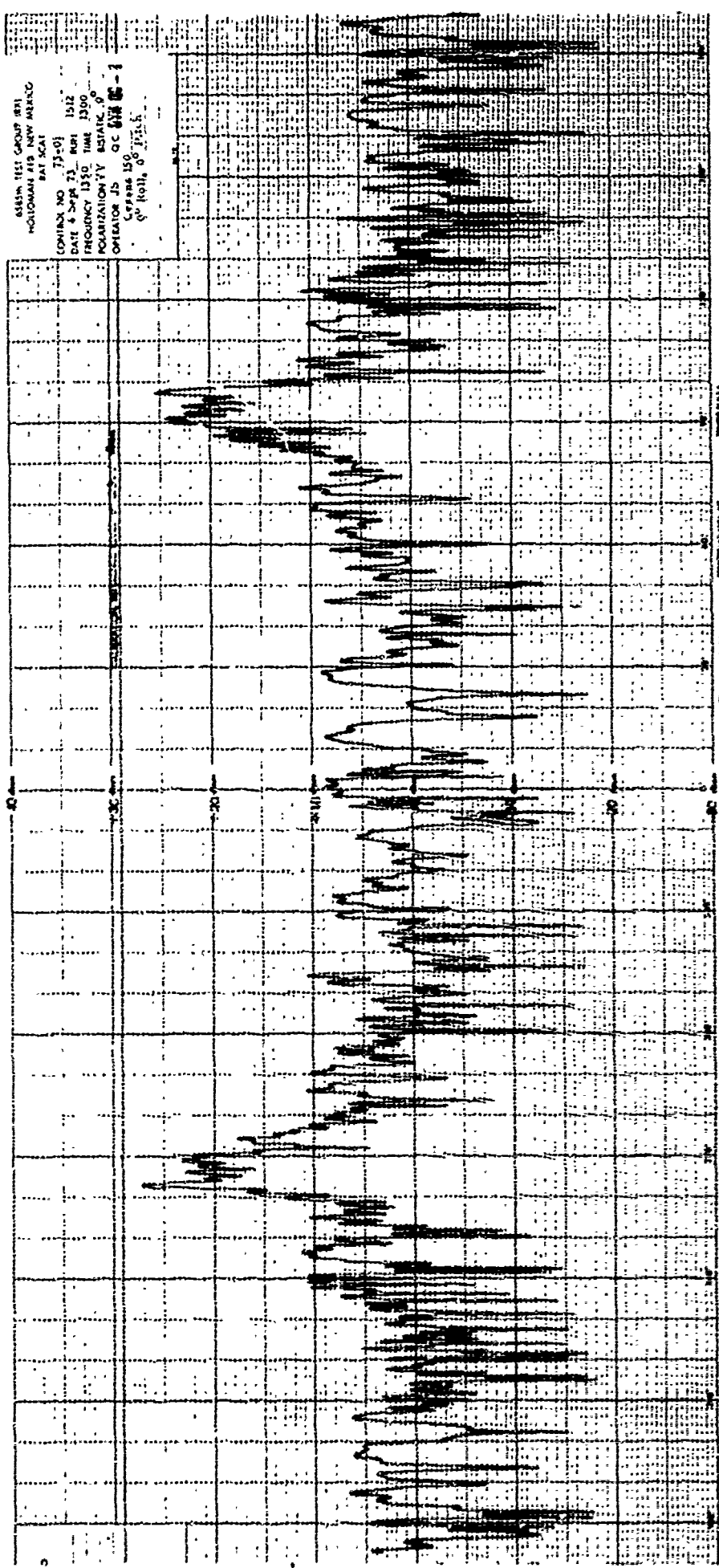
MOUNTAIN R.R. BTRAC 00

OPERATOR JIS G.C. 00

CRASH 150 00

0.000 0.000 0.000

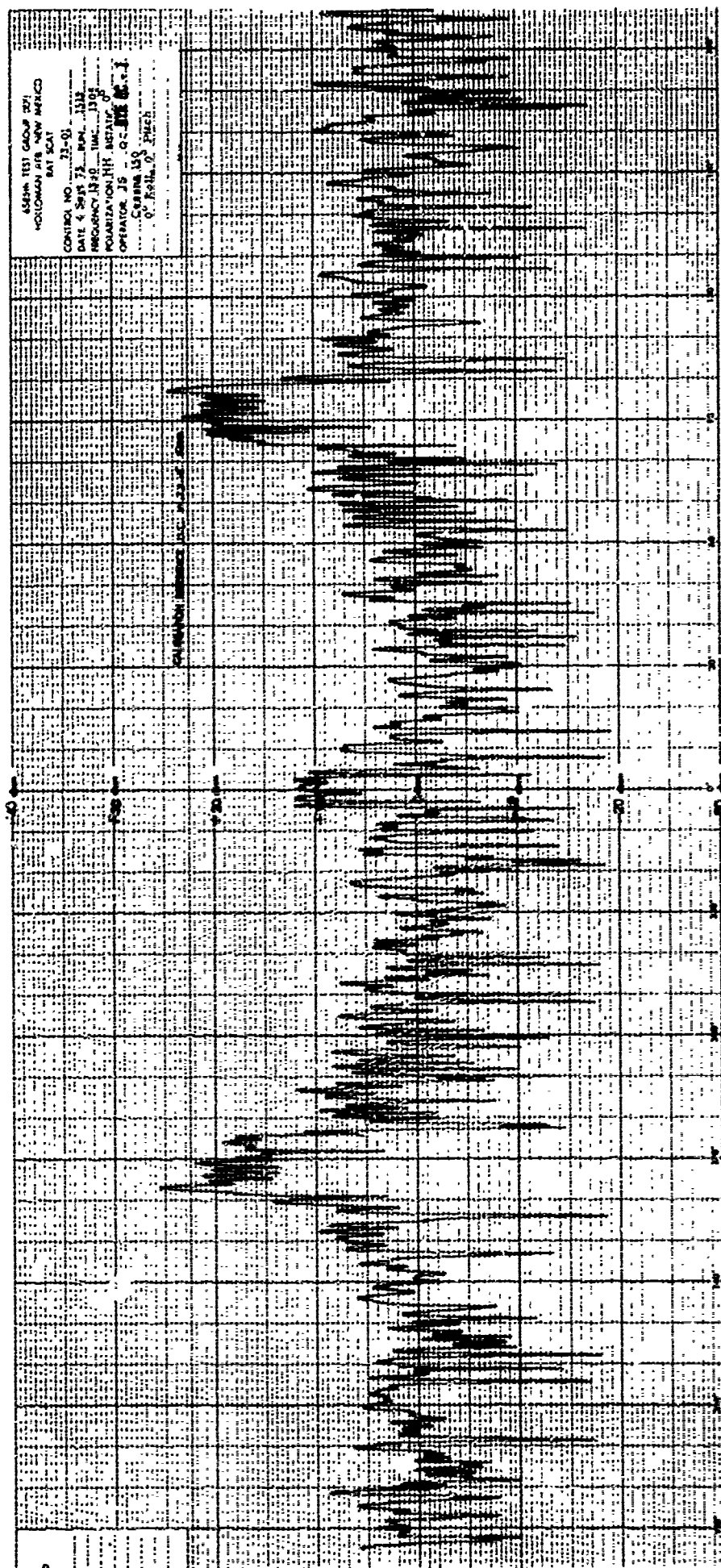


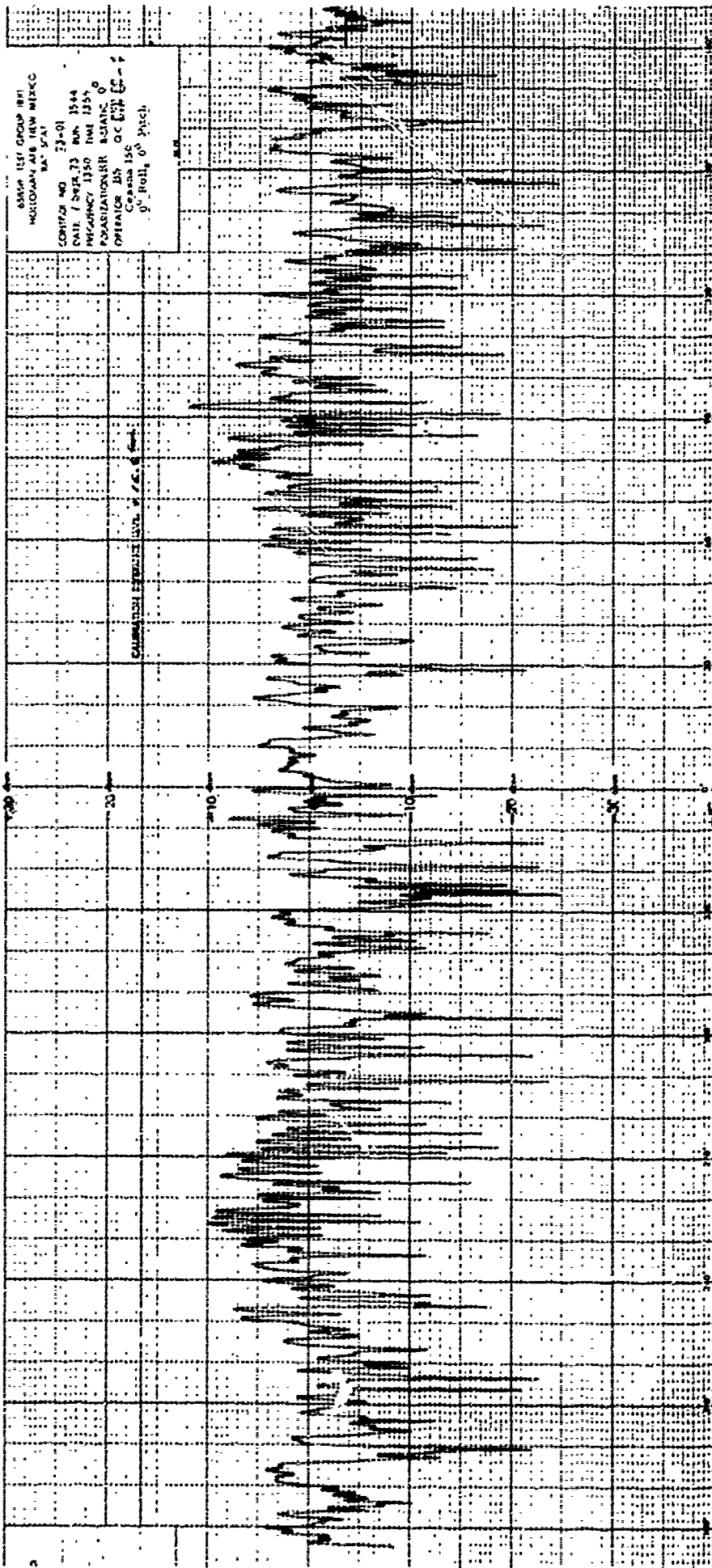


ASSIGN TEST GROUP 881  
HOLLOMAN AIR NEW MEXICO  
PAT SCAT  
CONTRACT NO. 73-01 1512  
DATE 4 SEP 73 RPT 1200  
FREQUENCY 1370 TIME 1200  
POLARIZATION TV ESTABLISHED  
OPERATOR JS GC 012 00-1  
CYPRESS 150 00 11.5  
6th Roll, 0 11.5

658344 TEST GROUP 3371  
HOLLANDIAN AIR NEW MEXICO  
BAT SCAT

CONTROL NO. 73-01  
DATE 4 Sept 72  
FREQUENCY 13.0 MC  
POLARIZATION HH  
OPERATOR JS - G-116  
CROSS 150  
0° Roll 0° Pitch







STATION TEST GROUP 141  
HOLSTON AIR NEW MEXICO  
RAT XCAT

CONTRACT NO 12-01

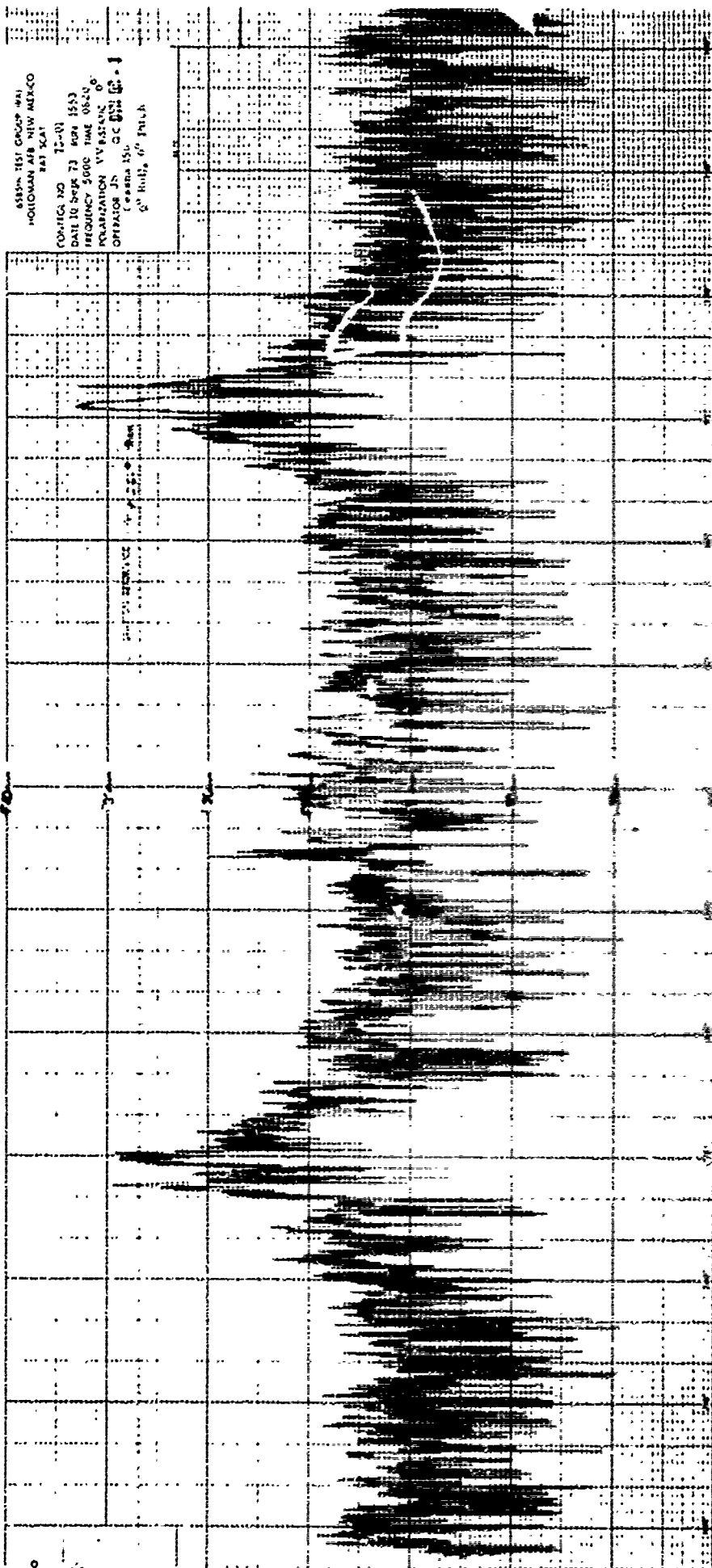
DATE 10 SEP 73

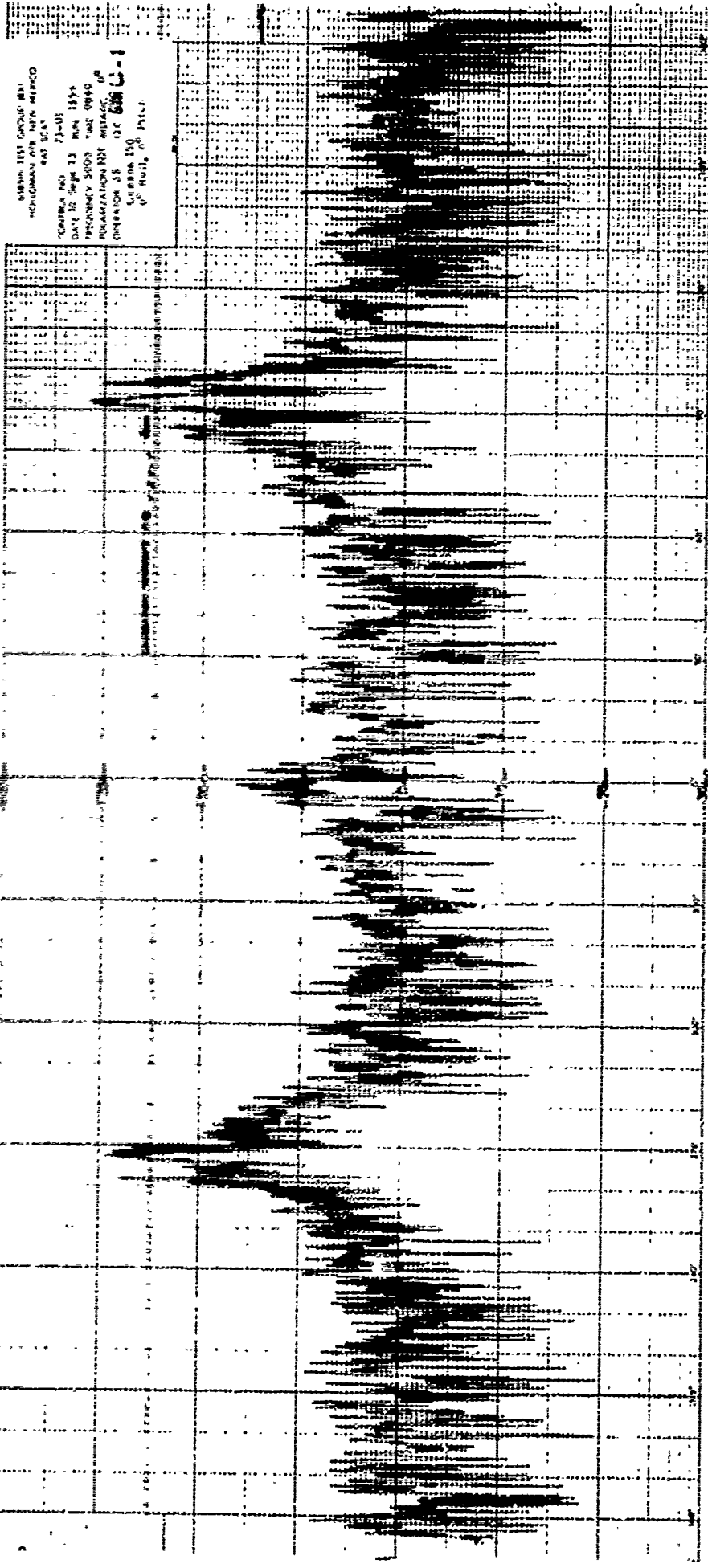
FREQUENCY 5000 HZ

POLARIZATION VERTICAL

OPERATOR JN

6" Bull's 6" Pitch





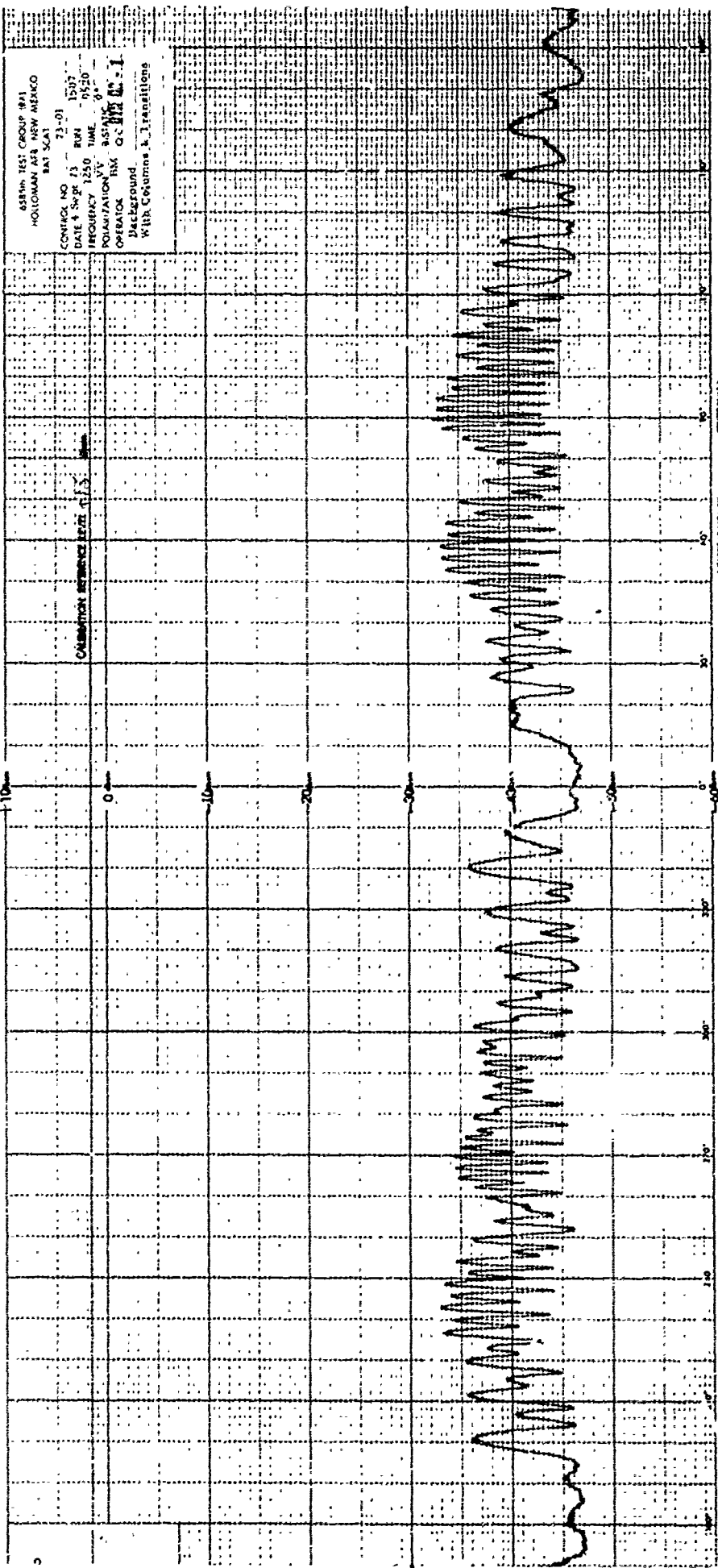
WIND TEST CODE: 101  
WINDMAN AIR NEW MEXICO  
WAT 501  
DATE: 10 Sep 13 RUN 1355  
FREQUENCY 5000 TAD 0840 00  
OPERATOR: J8 13C 688 C-1  
VERBIA 150  
(6) Net, 00 Pkt.

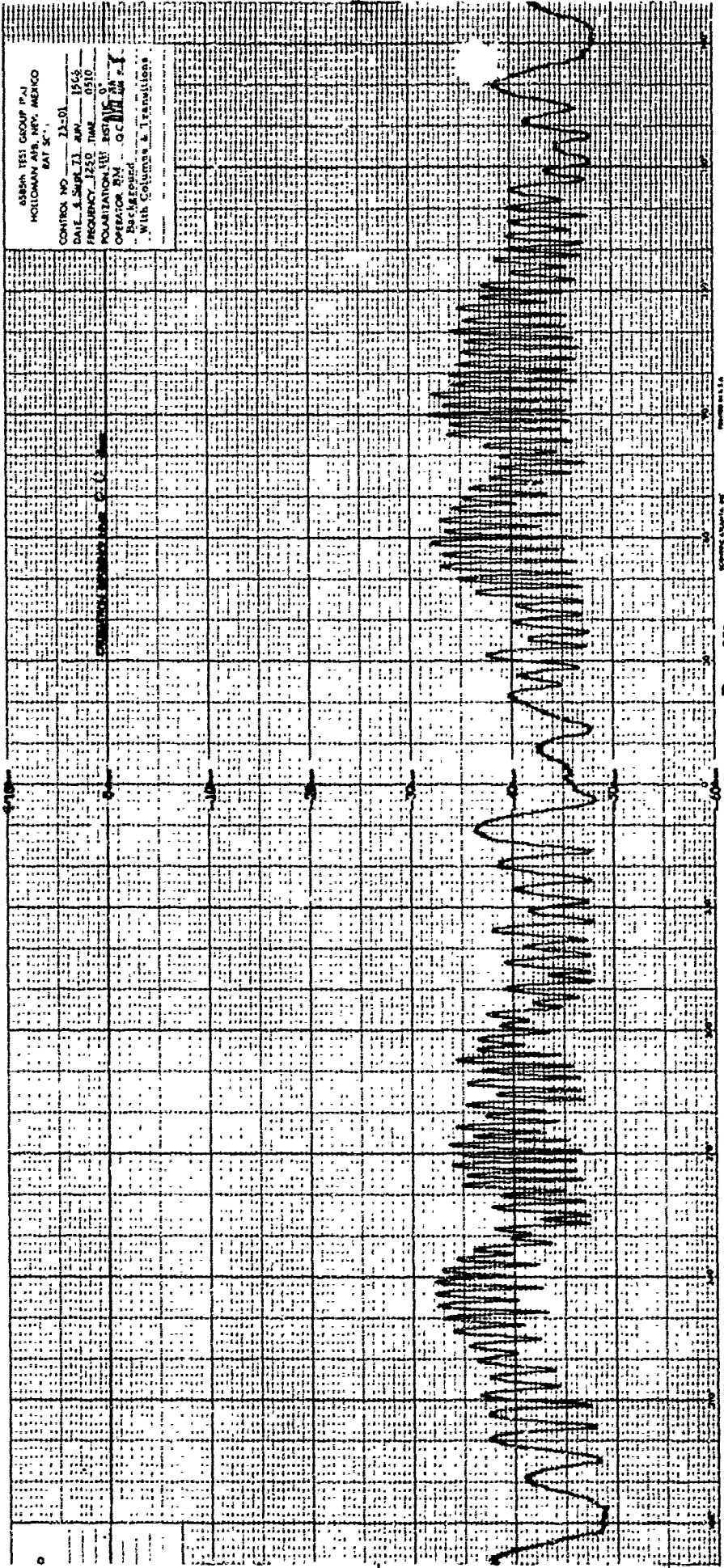


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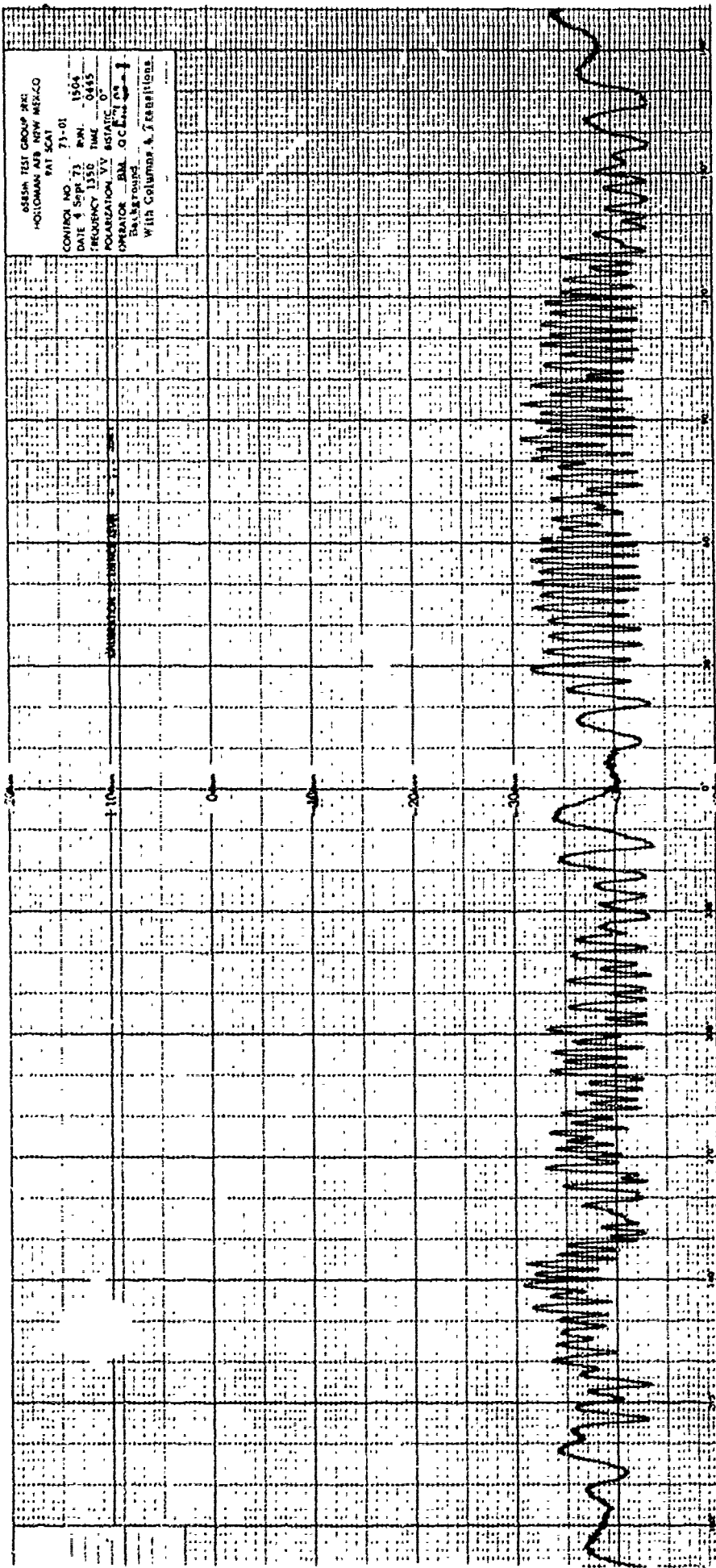
Dr. J. B. McLaughlin, Jr., 10000 E. 1st Ave., Suite 100, Denver, CO 80231

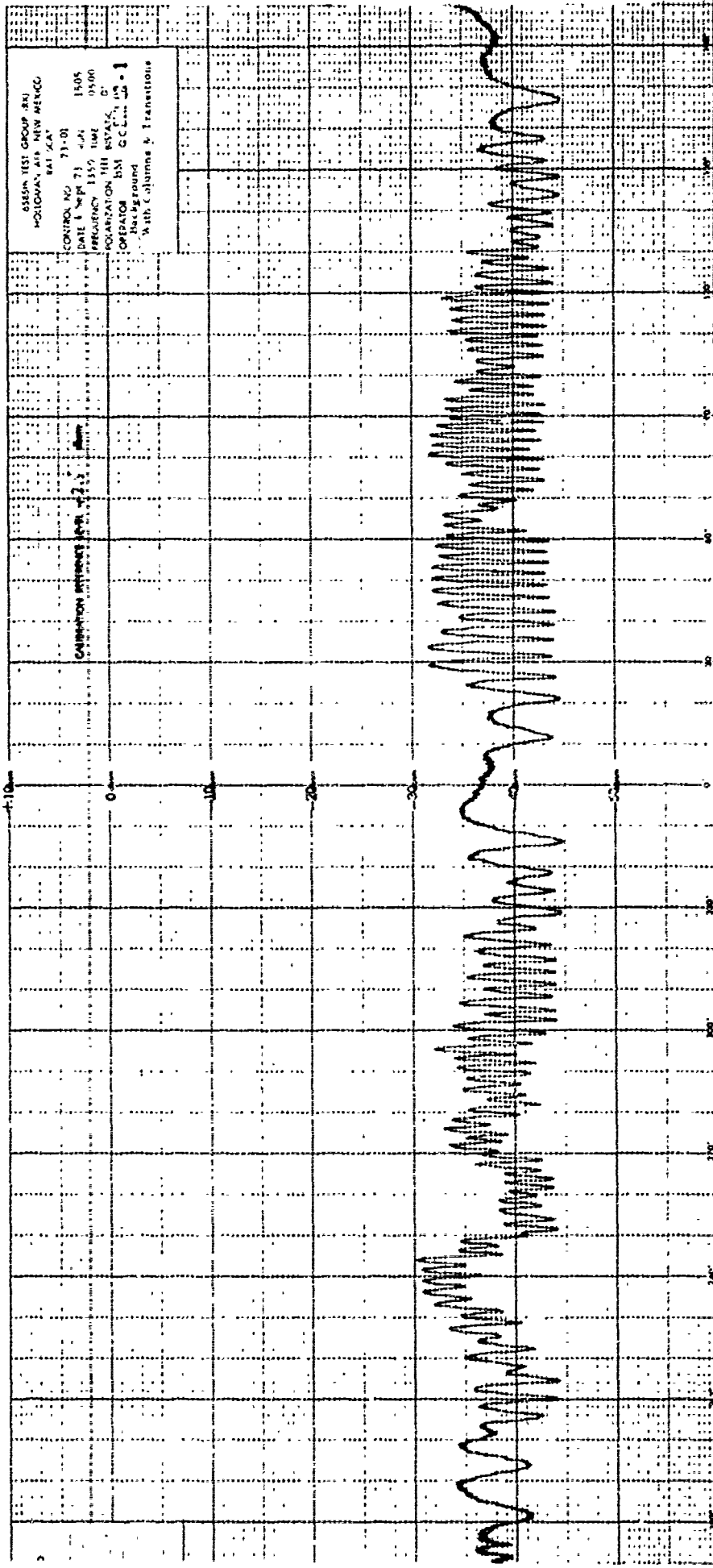


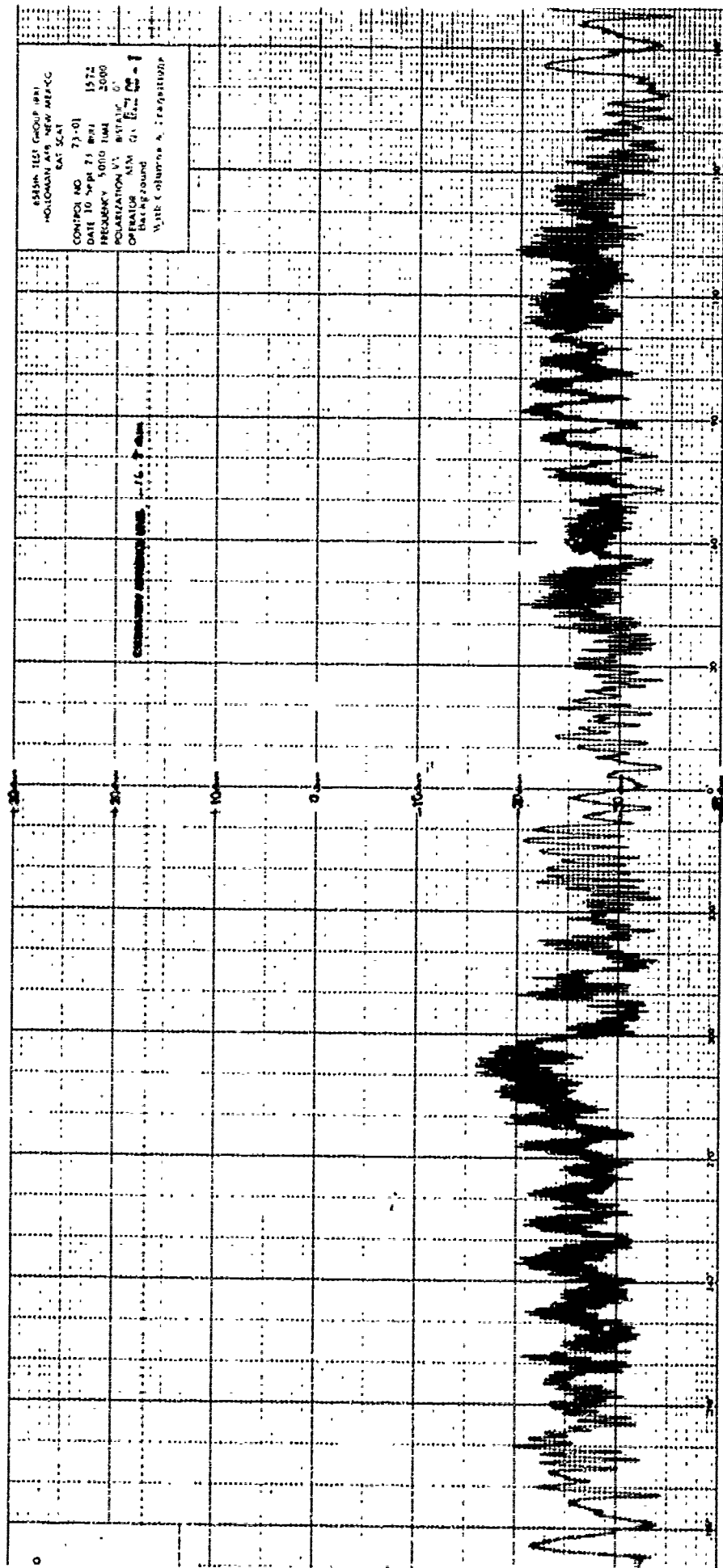


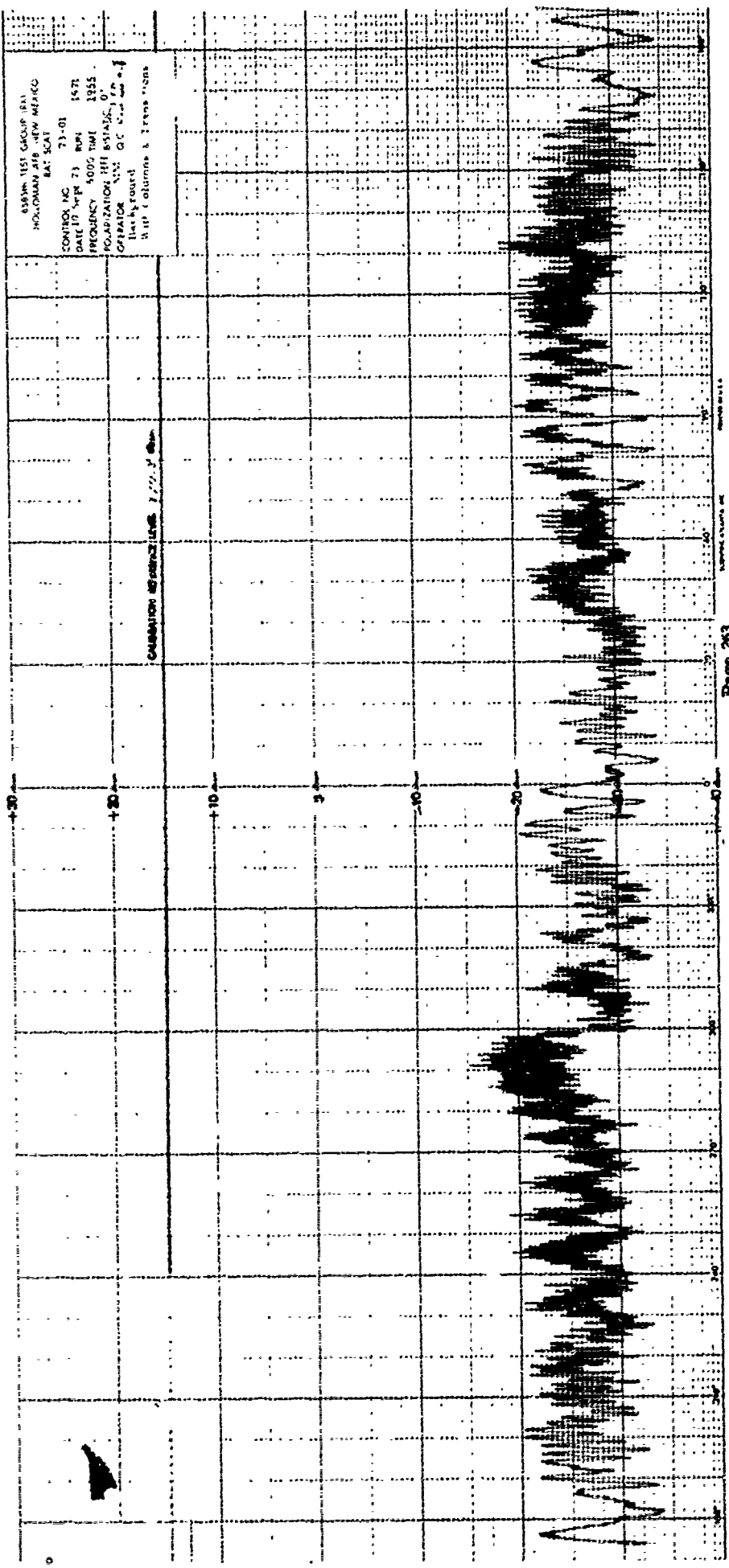


65554 TEST GROUP 212  
HOLCOMB, ARIZONA  
PAT 501  
CONTROL NO. 71-01  
DATE 4 SEP 73 P.M. 1964  
FREQUENCY 1350 TIME 0445  
POLARIZATION VV STATIC 0  
OPERATOR BML O.C. 2-1  
Background  
With Column A, 2 repetitions.

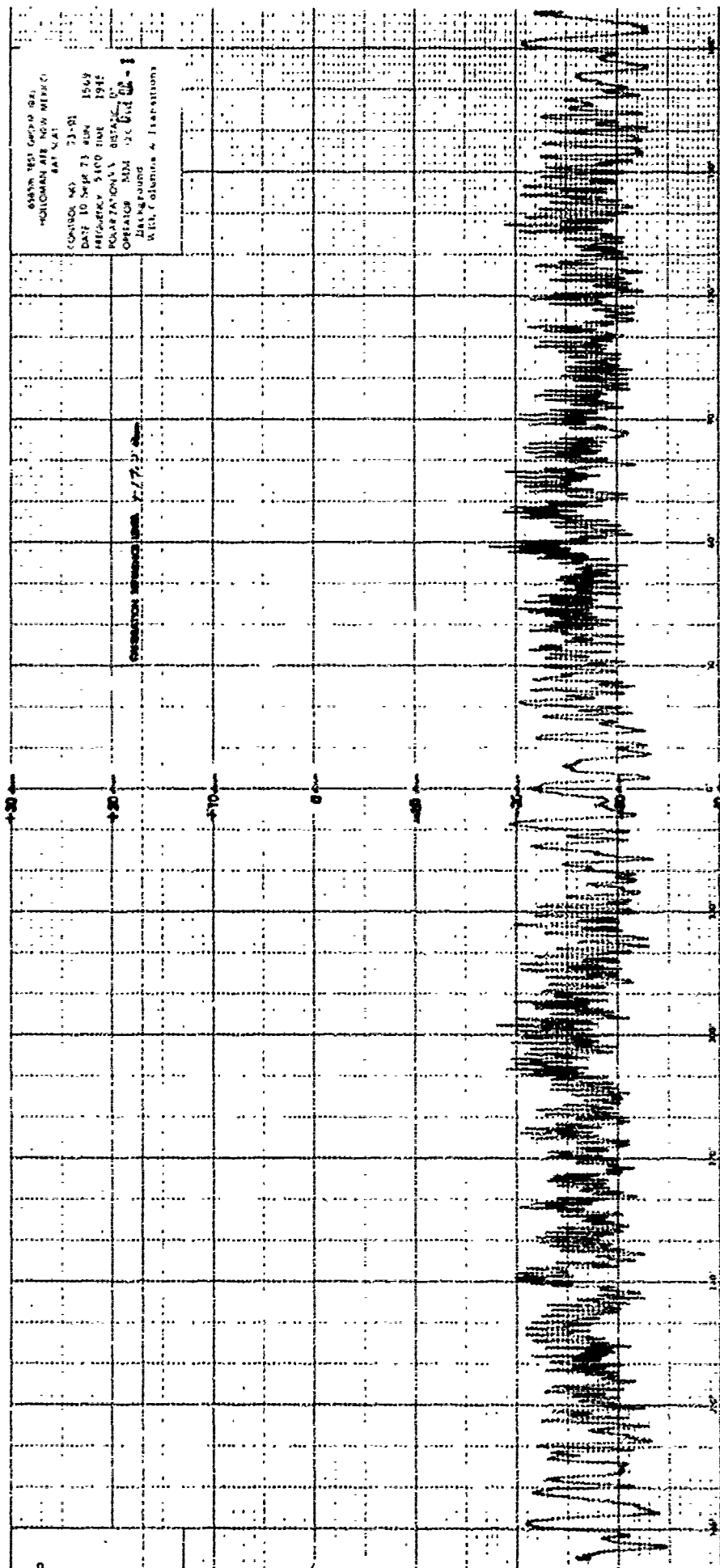














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### APPENDIX A SITE INTRODUCTION

#### 1. GENERAL

RAT SCAT is a static ground plane radar cross section measurement site, located on Alkali Flats near Holloman Air Force Base, New Mexico. It is authorized by the DOD for use by governmental agencies. It is under the auspices of the 6585th Test Group, Air Force Special Weapons Center, Kirtland Air Force Base, New Mexico.

A ground plane range utilizes radar energy reflected from the earth as well as radar energy traveling directly to the target through the atmosphere. When the antennas and target are adjusted to proper heights, coherent phase addition of these electromagnetic waves into a flat wave front, enhances the system sensitivity. Radar returns from objects near the earth's surface are reduced thus suppressing target area interference. Target area interference is reduced further through the use of special polyfoam support columns, radar absorptive materials (RAM), and rotators located below the earth's surface (in pits).

Pulsed transmitters are employed to enable utilization of the range gated receiving system, which can selectively measure radar returns from the target area or the range displaced transfer standard. Background interference outside the target range is eliminated by range gating. Operation without background cancellation is therefore practical.

#### 2. CAPABILITIES

The RAT SCAT electronic equipment and controls are housed in a permanent building. Three separate range lengths (458 feet, 1158 feet, and 2458 feet) are provided for range variation as shown in Figure A-1. This allows the use of convenient antenna and target heights while satisfying the far field criterion for most targets. (Special 40-foot antenna towers are attached to the building for antenna height positioning.) Further versatility is provided by two mobile equipment vans, one for monostatic range length variation and one for bistatic measurements. A duplicate set of control and data consoles in the main building enables simultaneous operation of any two of the three ranges. A summary of the RAT SCAT characteristics is contained in Table A-1.

#### 3. CALIBRATION

The normal method of calibration at RAT SCAT is to mount a primary standard (precision sphere) scatterer with a known radar cross section and record the corresponding signal level. Then the return from another secondary standard (corner or Luneberg lens) scatterer

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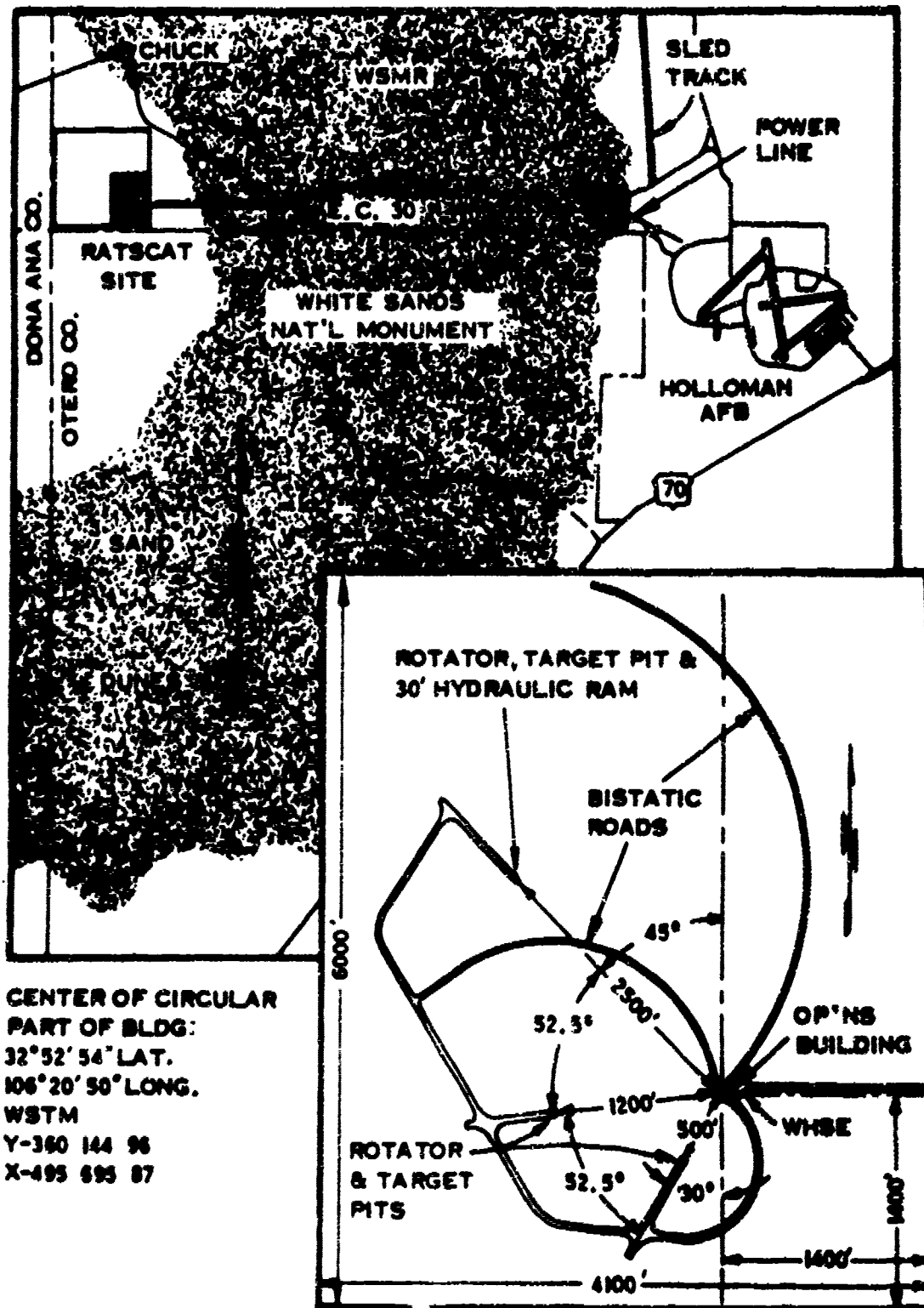


Figure A-1 MAP OF RAT SCAT SITE

A-2

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TABLE A-1

RAT SCAT CHARACTERISTICS OF ELECTRONIC EQUIPMENT

Power Output	1 KW nominal bands 1 through 8, 25 KW nominal Ku, Ka bands
Pulse Width	0.1 to 1.0 microsecond
Pulse Repetition Frequency	500 to 5000 pps
No. of Receiving Systems	Two per band, (one monostatic and one bistatic)
Receiver Minimum Detectable Signal	-94 dbm nominal
Receiver Bandwidth	2 or 10 Mhz (selectable)
Range Gate Width	0.1 to 1.0 microsecond (50 to 500 feet)
Dynamic Range	70 db
Linearity	+0.5 db
Equipment Stability	0.1 db/hour (Average)
Analog Data Format	Polar and rectangular plots of cross section, glint and phase vs aspect angle
Digital Data Format	7 or 9 track magnetic (see Appendix C)
Antennas	1, 2, 3, 4, 6, 10, and 16 foot parabolic dishes (smaller and larger dishes available for special tests)
Antenna Feeds	Linear and circular horns with VSWR less than 2.0 to 1.0
Polarization	Horizontal, vertical, circular, elliptical in any transmitting and receiving configuration.
Background Level	As low as -80 dbm (frequency dependent)
Background Reduction	Tuned columns and vector subtraction by using phase and amplitude measurements to reduce background by 20 db
Phase Measurement	Unique RAT SCAT capability for vector subtraction or scattering matrix applications
Azimuth Resolution	0.1 or 0.01 degree as applicable
Maximum Target Weight	40,000 pounds
Target Size	Greater than 60-foot length
Bistatic Capability	Primary ranges of 458 , 1158 , and 2458 feet for 0 to 160 degree bistatic angle
Frequency Coverage	100 to 18,000 MHz continuous, Ku, Ka bands and 95 GHz

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Band 1 - 100 to 250 MHz  
Band 2 - 250 to 500 MHz  
Band 3 - 500 to 1000 MHz  
Band 4 - 1000 to 2000 MHz  
Band 5 - 2000 to 4000 MHz  
Band 6 - 4000 to 8000 MHz  
Band 7 - 8000 to 12,000 MHz  
Band 8 - 12,000 to 16,000 MHz

Ku, Ka bands;  
95 GHz

Range Length 300 feet minimum

Building/Pit 1 - 458 ft  
Building/Pit 2 - 1153 ft  
Building/Pit 3 - 2458 ft  
Monostatic Van/Pits 1, 2, or 3 - variable range length

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displaced in range is recorded as a transfer standard. Both the precision standard return and the transfer standard return are recorded on the same plot. Thereafter, radar cross section calibration is determined by referencing the transfer standard return for every run. Thus every run is recalibrated. The comparisons of primary and transfer standards accomplished before and after each measurement series are identified respectively as calibration and post-calibration. If the direct ratio of primary to secondary readings is not maintained before and after the measurement series, then all runs between are invalid and must be repeated.

The calibration reference level marked on each data plot is related to the transfer standard level. This reference level may under controlled conditions differ from the actual transfer standard signal level since precision calibrated attenuation is sometimes inserted in the receiver line. When such attenuation is inserted, returns from the transfer standard are reduced to a level compatible with the scale used for the target measurements. The 70 db dynamic range of the plot is placed to include the range of returns expected from the vehicle being measured. In some cases two runs are necessary to be plotted for direct overlay to include the dynamic range of the vehicle if it exceeds 70 db. Calibration plots are included with the target data when requested by the user.

The sphere calibration plots will not necessarily be straight lines. If the background return is within 20 db of the sphere return, for example, a variation in sphere return of approximately  $\pm 1$ db can result. For calibration the sphere is intentionally placed at least  $1/2$  wavelength off the center of table rotation to insure sufficient phasing with the background return. The average sphere return is then chosen for a calibration level. This avoids the peak errors involved with coherent addition of sphere return and background return and allows the minimum errors involved with non-coherent addition of the returns. This is indicated in Figure A-2.

#### 4. OPERATING PROCEDURES

The following step-by-step procedure is standard in obtaining monostatic radar cross section measurements after frequency, feeds, antennas, antenna height, target height, and pit (range length) have been chosen:

1. Calibration - As described in previous section.
2. Horizontal and vertical probes (field strength measurements at the target area) - Horizontal probes at the target area have been shown to be redundant for azimuthal boresighting. For this reason, these probes are taken only upon request for examination of near field effects.

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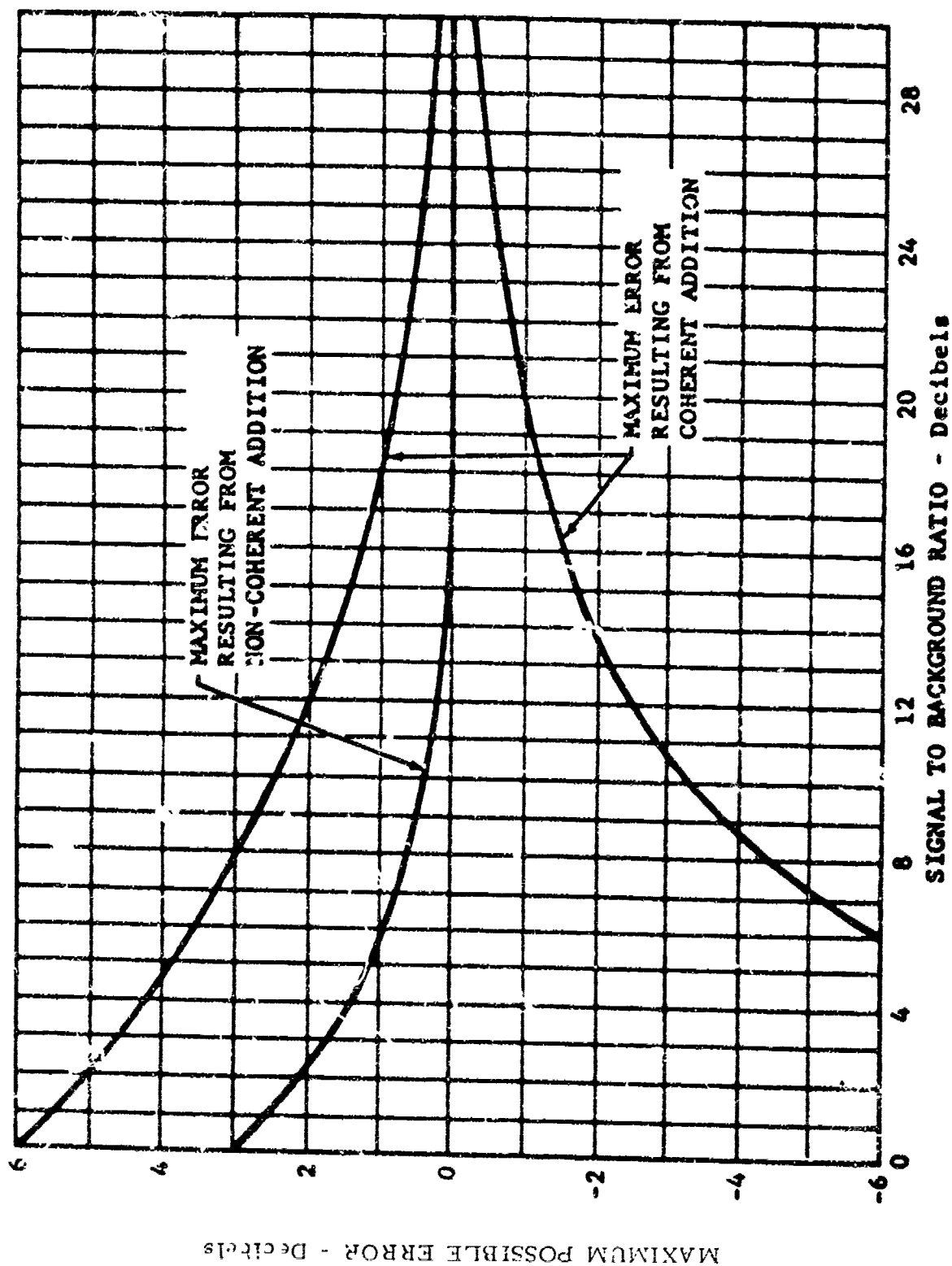


Figure A-2 PLOT OF ERROR INDUCED BY BACKGROUND INTERFERENCE

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Vertical probes are taken at the target area to determine power variation as a function of target height. If necessary, antenna height is varied to obtain an acceptable vertical probe which then necessitates a new calibration.

3. Background - The background level with the target mount in place is measured in each polarization to be used.

4. Measurement - The measurement is made with the vehicle in the position previously occupied by the primary standard.

5. Calibration - The primary calibration is repeated to verify calibration (post calibration).

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APPENDIX B  
TARGET ORIENTATION AND DATA FORMAT

1. COORDINATE SYSTEM

The coordinate system described herein has been adopted as a standard for RAT SCAT operations. The system is referenced both to the vehicle being measured and to the measurement site.

a. Vehicle Reference

A three-axis system, referenced to an arbitrary vehicle, is illustrated in Figure B-1. In this system three mutually perpendicular planes (yaw, pitch, and roll) are passed through the vehicle so that the pitch and yaw planes mutually intersect on the longitudinal axis of the vehicle. These planes remain fixed with respect to the vehicle, regardless of vehicle rotation with respect to the radar or ground plane. The yaw plane, which includes the pitch axis and the roll axis, is numbered from 0 degrees to 360 degrees in a clockwise direction when the vehicle is viewed from above. The nose-on aspect corresponds to 0 degrees, the starboard side of the vehicle corresponds to 90 degrees, and the port side to 270 degrees. The pitch plane, which contains the roll axis and the yaw axis is numbered from 0 degrees to  $\pm 180$  degrees; the + 90 degree point is below the center line, and the - 90 degree point is above the center line. The roll plane contains the yaw axis and the pitch axis. It is numbered from 0 degrees to 360 degrees, and the numbers increase in a counterclockwise direction when the vehicle is viewed from the rear.

b. Site Reference

As previously stated the coordinate system is fixed with respect to the vehicle. It is referenced to the site by means of three index marks. The exact value of any of the three angles is determined by noting the value of the vehicle coordinate opposite the index marks. Index marks come from such devices as bubble levels, inclinometers and transits.

As illustrated in Figure B-2, the index for roll angles is normal to the axis of rotation. As illustrated in Figure B-3, the index for pitch angles is normal to the axis of rotation and in line with the apparent source of radiation. For measurements at the RAT SCAT Site, targets can be mounted to provide desired pitch and roll angles.

c. Coordinate System Tilt

For small targets another angle, tilt, can be utilized in recording useful data. This angle, equipment-limited to less than 15 degrees, is formed by the axis of rotation and the normal to the line of sight to the

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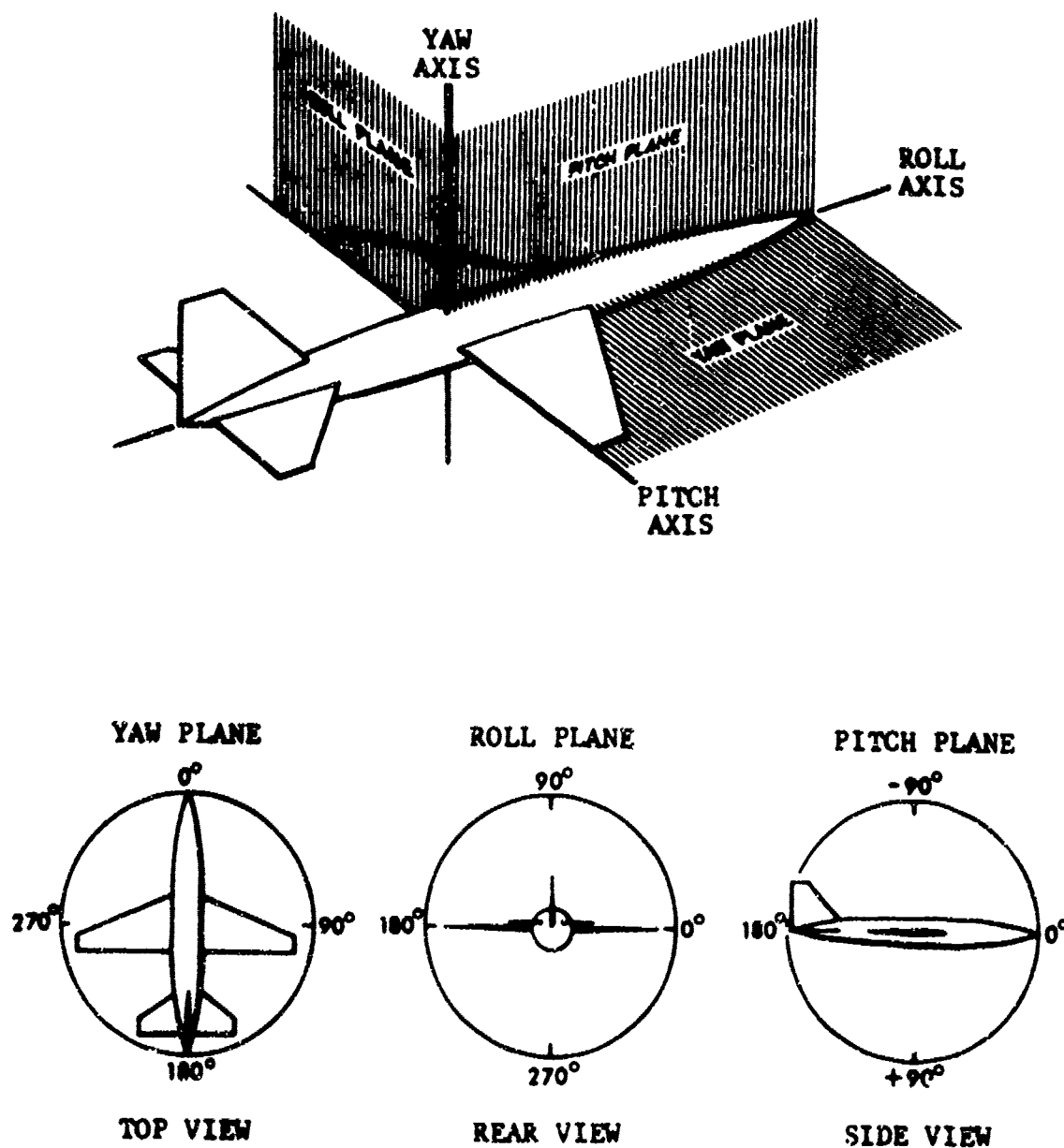
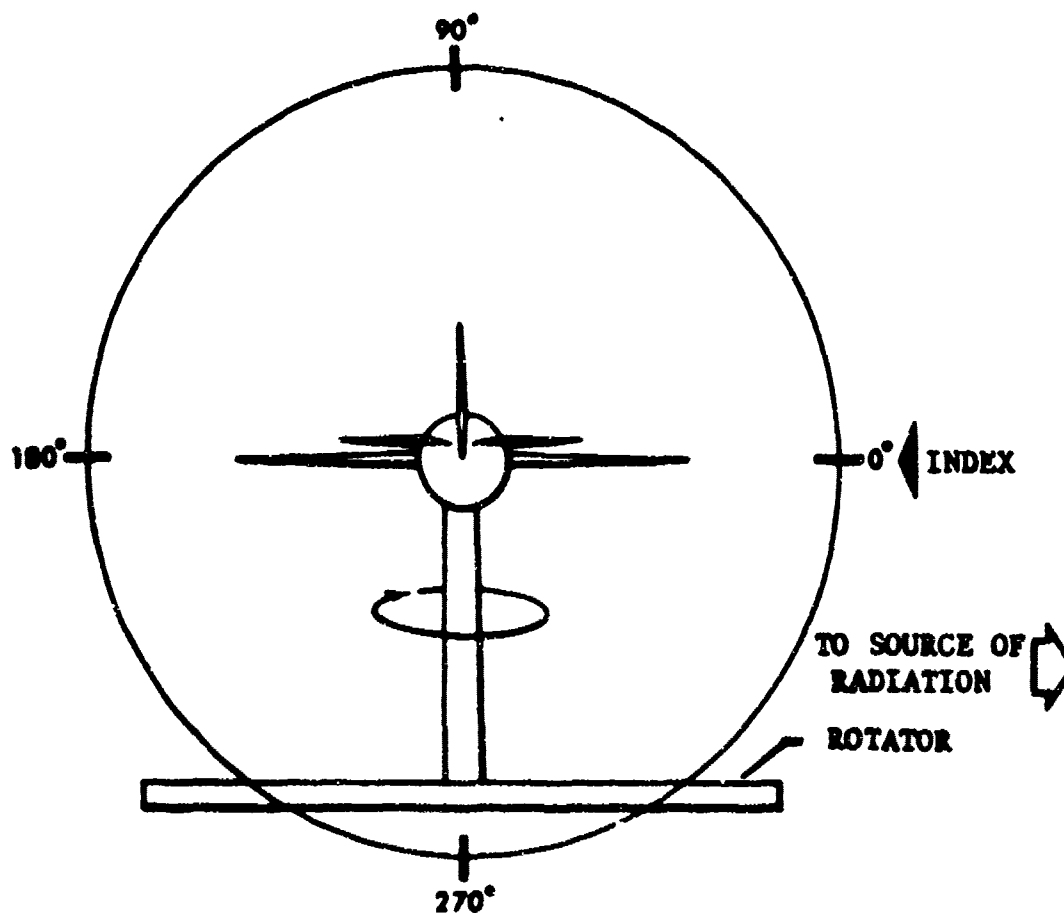


Figure B-1 VEHICLE COORDINATE SYSTEM

B-2  
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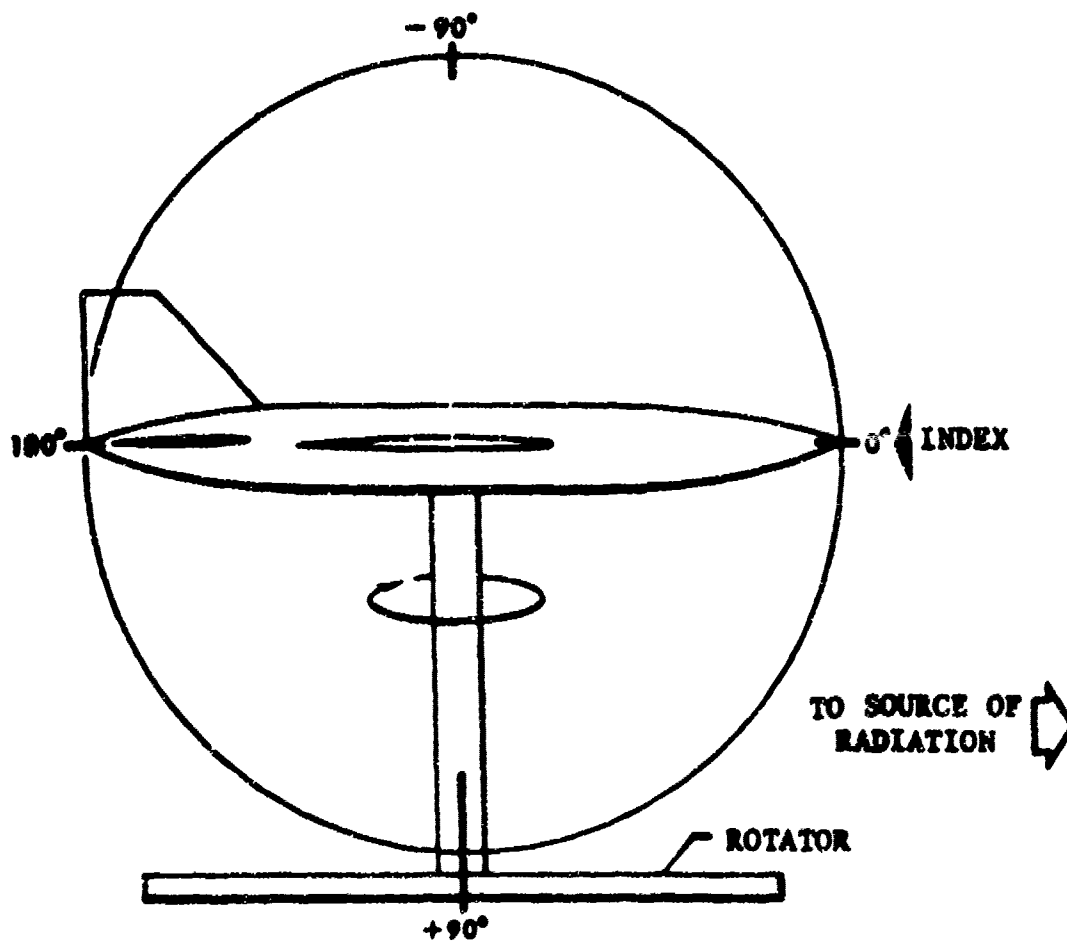
**NOTE:** The roll scale is fixed to the vehicle. The amount of roll is determined by noting the number of degrees opposite the index. Clockwise rotation of the target (when viewed from the rear) increases the roll angle.

**Figure B-2 TARGET ORIENTATION - ROLL**

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**NOTE:** The pitch scale is fixed to the vehicle.  
The number of degrees of pitch is determined  
by noting the scale value opposite the index.

**Figure B-3 TARGET ORIENTATION - PITCH.**

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apparent source of radiation. Since, in a ground plane range, radiation can be considered to emanate from a point with zero height directly beneath the antennas, a zero-degree tilted axis of rotation is slightly off the geometrical vertical. This small deviation from the geometrical vertical is neglected in the following discussions.

A target mounted with a pitch angle other than zero displaces the yaw axis from the vertical, but not the axis of rotation. The axis of rotation is displaced from the vertical only when non-zero tilt is employed. Tilting toward the radar is considered positive tilt and away from the radar is negative tilt. For monostatic measurements tilt will be measured in the vertical plane containing the line of sight between the radar and the target. The difference between pitch and tilt is shown in Figure B-4.

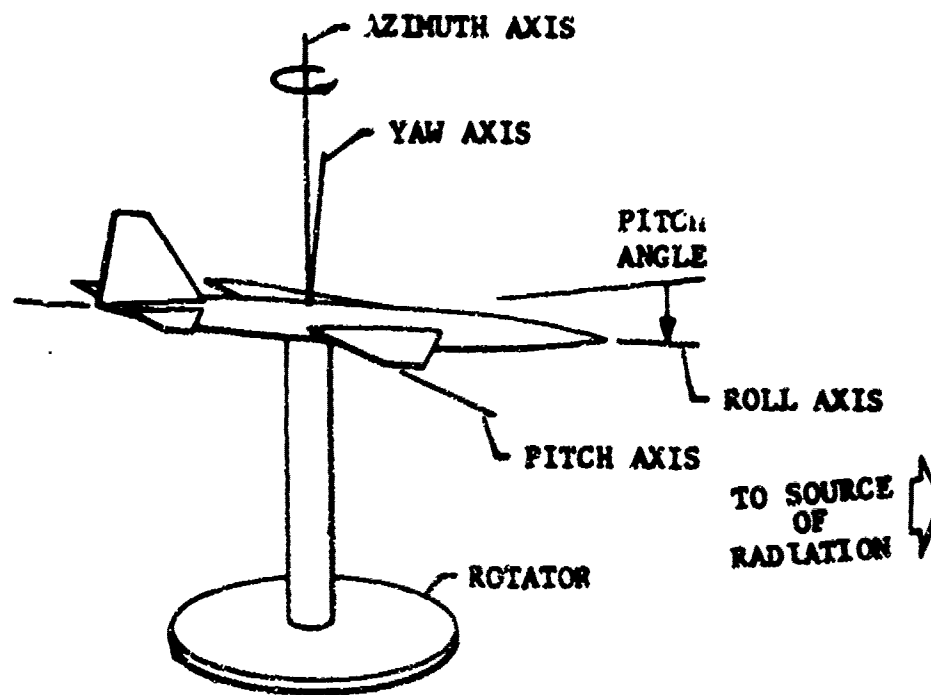
### 2. DATA FORMAT

Data recorders obtain azimuth angle information by means of precision synchro signals from the position of the rotating table. The line of sight from the antennas to the center of the rotator, as illustrated in Figure B-5, indexes azimuth angles. As used here the term azimuth refers to the position of the target rotator table. With zero degrees of pitch and roll, azimuth and yaw are identical. It is standard practice to turn the rotator in a clockwise (cw) direction as viewed from above. Consequently, the azimuth angle varies, for example from 180 degrees (tail-on) to 90 degrees (starboard-side) to 0 degrees (nose-on) to 270 degrees (port-side).

#### a. Polar and Rectilinear Plots

Essential information pertinent to each plot is contained in the information block located in the upper right hand corner of the rectilinear plots and in the second quadrant of the polar plots. Each rectilinear plot has the recording of the return from the left side of the vehicle on the left side of the plot, 0 degrees at the center, and the recording of the return from the right side of the vehicle on the right side of the plot; 180 degrees (tail-on) appears at the right and left extremities of the plot, as shown in Figure B-6. Since the paper moves from left to right under the recorder pen, it should be noted that measurements are limited at 180 degrees in order to obtain continuous measurements on the recorder paper. The table on the polar recorder is rotated in the same directions as the target so the 90-degree point appears on the right side of the polar plot, the 270 degree point on the left, and the zero or 360 degree point at the top of the plot.

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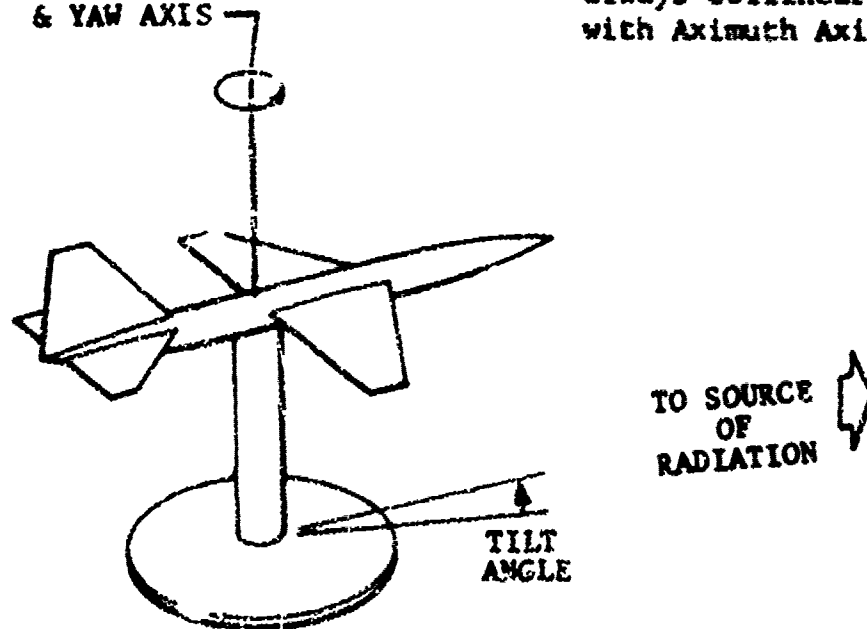


PITCH

NOTE:

Axis of rotation is  
always collinear  
with Azimuth Axis

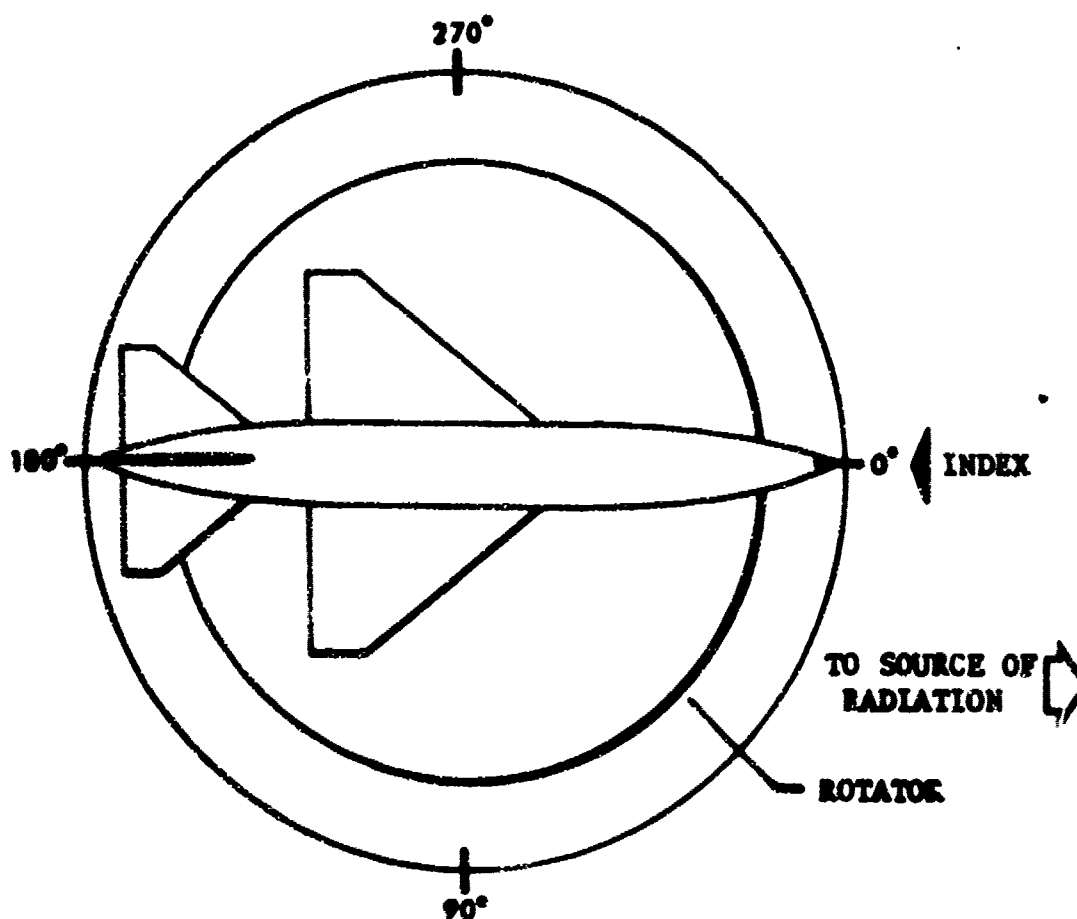
AZIMUTH  
& YAW AXIS



TILT

Figure B-4 COMPARISON OF PITCH AND TILT ORIENTATIONS

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**NOTE:** The azimuth scale is fixed to the target rotator. The azimuth value is determined by noting the value of the scale opposite the index mark as the rotator and scale revolve. The index is the line-of-sight from the radar antennas to the center of the rotator. (Azimuth angle data are transmitted to the data recorders by means of synchro signals.) The standard direction of rotation will be clockwise.

Figure B-5 TARGET ORIENTATION - AZIMUTH

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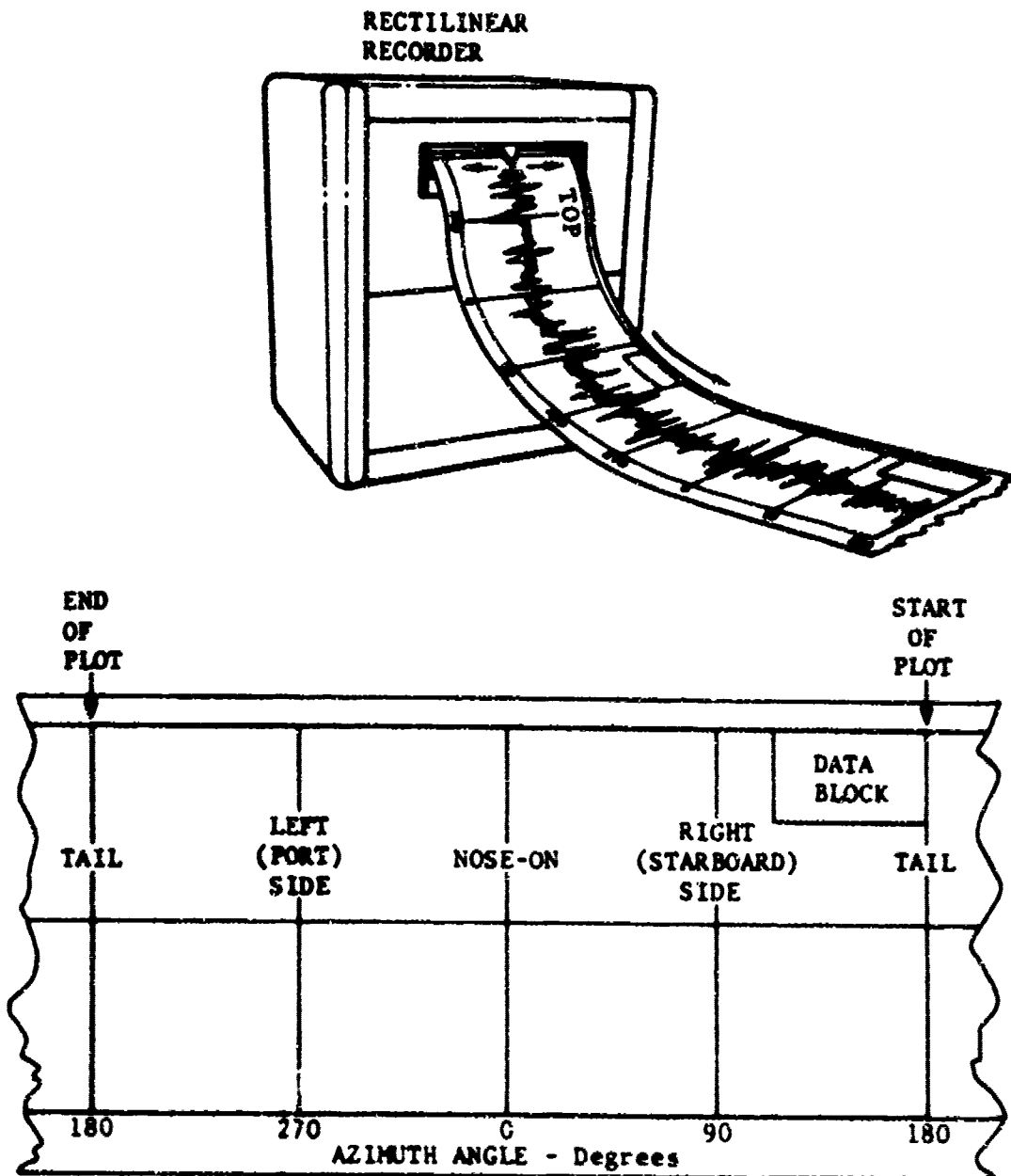


Figure B-6 FORMAT FOR RECTILINEAR PLOTS